JANUARY, 1927

Railway Engineering and Maintenance

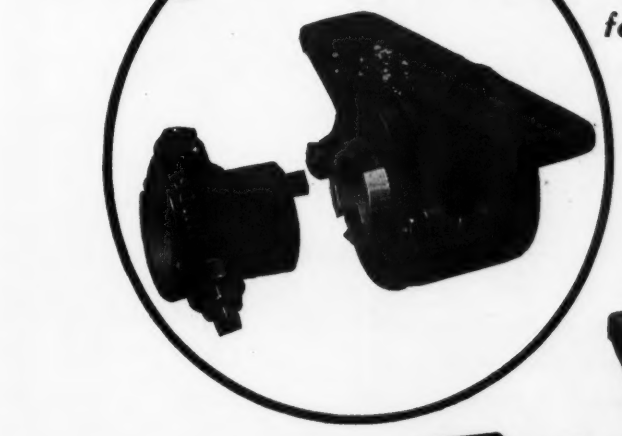
RAILWAY ENGINEERING AND MAINTENANCE
Published monthly by Simmons-Boardman Publishing Co., at 608 S. Dearborn St., Chicago. Subscription price: United States, Canada and Mexico, $2.00; foreign countries, $3.00 a year. Single copy, 35 cents. Entered at Chicago, Ill., as second-class matter.

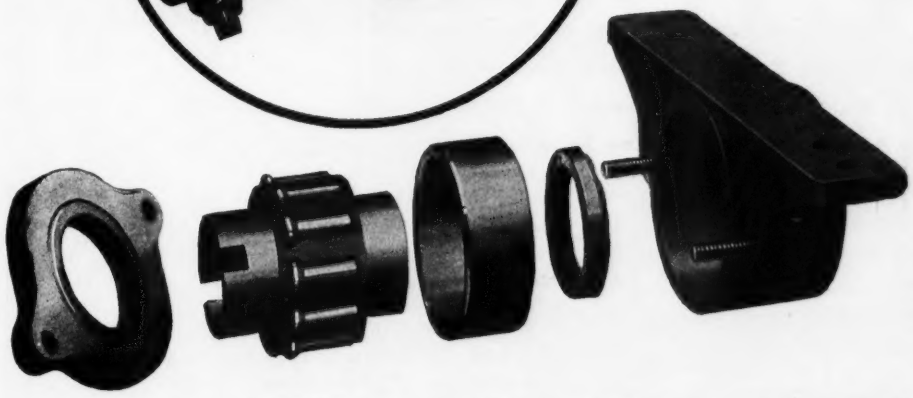
Alphabetical Index to Advertisers, Page 60 Classified Index to Advertisers, 58-60

Mudge-Bower Roller Bearings

for Motor cars, Push cars and Trailers

Increase load Capacity 330% without cutting axles





Easily applied to practically all types and makes of motor cars, push cars, and trailers using standard 1 7/16" or 1½" axles.

AFTER two years' research by our engineers, assisted by several railroads and the bearing manufacturers, we have perfected the new Mudge-Bower Axle Bearing in which both radial and thrust loads are carried on hardened inner and outer races instead of directly on the axle and the axle box as before. This results in a greatly increased load capacity and the elimination of all wear and cutting of the axle and axle boxes.

This new bearing will enable many railroads, who have tried to increase the load capacity of Push Cars by increasing the size of the axles, to solve their problem in a simple way and without disturbing standards.

Most Motor Car, Push Car, Hand Car, and Trailer Axles are either 1½" or 1 7/16", both sizes having 1 7/16" bearing fit. This bearing fit size can now be made standard for use on all of these cars because the New Mudge-Bower Roller Bearing will safely carry 100% greater load than a 2" diameter roller bearing 4" long of the type used heretofore, operating directly on a soft axle of .35 to .45 carbon steel, 165 Brinell hardness.

We recommend the well known Mudge 1 7/16" axle, S.A.E. 1045 steel for use with this Roller Bearing.

Ask for full information.

Mudge & Company

Manufacturers—Railroad Equipment
Railway Exchange Bldg. • CHICAGO

CONTENTS

Volume 23 January, 1927 Number 1

294

Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

ELMER T. HOWSON, *Editor*
WALTER S. LACHER, *Managing Editor*
N. D. HOWARD, *Associate Editor*
F. C. KOCH, *Business Manager*
H. F. LANE, *Associate Editor*, (Washington, D. C.)
F. M. PATTERSON, *Associate Editor*

Published on the last Thursday preceding the date of issue by the

Simmons-Boardman Publishing Company, 608 South Dearborn Street, Chicago, Ill.

EDWARD A. SIMMONS, *President*
L. B. SHERMAN, *Vice-Pres.*
HENRY LEE, *Vice-Pres. & Treas.*
SAMUEL O. DUNN, *Vice-Pres.*
F. H. THOMPSON, *Vice-Pres.*
C. R. MILLS, *Vice-Pres*
ROY V. WRIGHT, *Sec'y*

NEW YORK: 30 Church Street
MANDEVILLE, LA.
CLEVELAND: 6007 Euclid Avenue
WASHINGTON: 17 and H Streets, N. W.
SAN FRANCISCO: 74 New Montgomery Street
LONDON, England: 34, Victoria St., Westminster, S. W. 1
Cable Address: Urasigmec, London

Entered at the postoffice at Chicago, Ill., as mail matter of the second class.

Request for change of address should reach us two weeks before the date of the issue with which it is to go into effect. It is difficult and often impossible to supply back numbers to replace those undelivered through failure to send advance notice. In sending us change of address please be sure to send us your old address as well as the new one.

Subscription price in the United States, Canada and Mexico, $2.00 per year; foreign countries $3.00. Single copies, 35 cents. Foreign subscriptions may be paid through our London office (34, Victoria Street, S. W. 1) in £-s-d.

Railway Engineering and Maintenance is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulation (A. B. C.)

One Man Tip-up Seat—easy access to engine without unloading track tools, dinner buckets, etc.

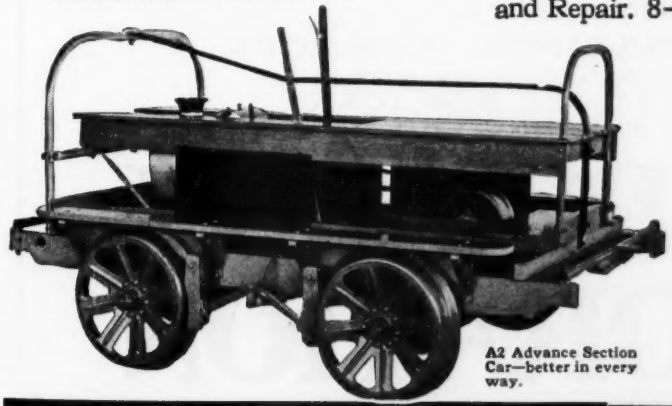
FAIRMONT Advance Drive—Endless Cord Belt—light tension—reduction by ball and roller bearing hardened steel gears in oil-tight dirt-proof case—change oil once a year.

Rugged Trussed Steel and White Oak Frame—no rivets—all parts replaceable.

Why HALF the Railway Motor Cars are Fairmont

In the words of an executive with 25 years' mechanical experience, ten of these years in charge of purchase and maintenance of all gas engines and cars on a Class A railroad—Fairmont Motor Cars are so popular with railroad men because of:

"1—Favorable Initial Cost. 2—Long Life. 3—Low Maintenance. 4—Easy Starting and Operation. 5—Simple. 6—Minimum Moving Parts. 7—Ease of Adjustment and Repair. 8—Water Cooling insures long continuous runs or stationary service. 9—Endless Cord Belt Transmission—low initial cost—freedom from failures—smooth and easy to handle. 10—Low Repair Stock Investment."



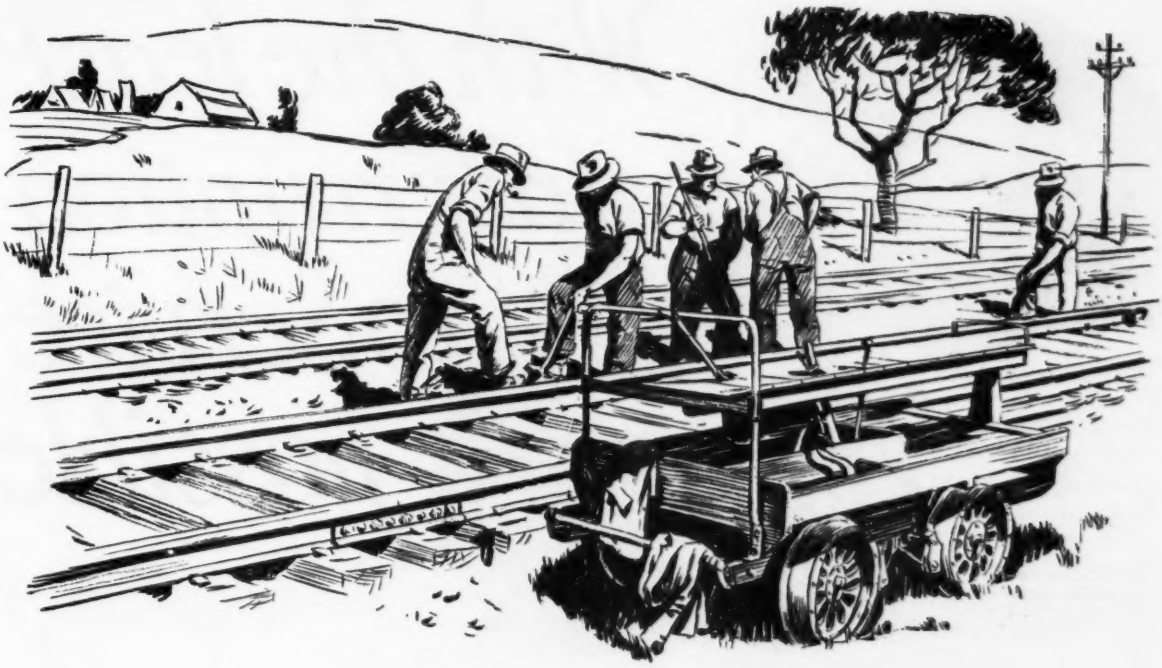
A2 Advance Section Car—better in every way.

FAIRMONT RAILWAY MOTORS, Inc.
FAIRMONT, MINNESOTA

DISTRICT SALES OFFICES:

New York Chicago St. Louis New Orleans
San Francisco Washington, D. C.
Winnipeg, Can.

BALDWIN LOCOMOTIVE WORKS
Foreign Representatives



Part of a good track gang

A RELIABLE CAR is an integral part of any good track gang.

It hauls a full complement of men and tools—and a trailer when needed—without journal trouble.

Hyatt equipped cars—supplied by a number of prominent builders, are exclusive equipment on many great railways because they have established their reliability.

One shot of grease every three or four months keeps Hyatt journal bearings running, and cars so equipped are extremely easy on gas.

Get Hyatt equipped cars for your gangs, and the cost will come back in the form of increased productivity per man in the maintenance of your *roadbeds*.

HYATT ROLLER BEARING COMPANY

Newark Detroit Chicago Oakland
Worcester Philadelphia Charlotte
Pittsburgh Cleveland

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

With the least Interruption to Service possible

Just 24 hours was required to complete the change shown here.

INTERRUPTIONS to service, may, at times, be unavoidable, due to accident, new construction work, or the necessity of installing a fitting in an existing line. It is then most important that the duration of the shutdown be held to a minimum.

This can be done by the use of Cast Iron Pipe and Fittings. The wide range of standard fittings, makes them readily available for any sort of repair or alteration of mains. There is none of the anxious and costly waiting for especially designed fittings.

The illustrations on this page show an interesting change in an existing line that was accomplished in less than 24 hours.

When Cast Iron Pipe is used, all joints are field joints. Each one is as good as the next—and all are equally tight and equally flexible.

It is Permanent—

No case has ever come to light where Cast Iron Pipe ever wore out under average service conditions.

We will be glad to aid you in similar problems in the building or alteration of mains.

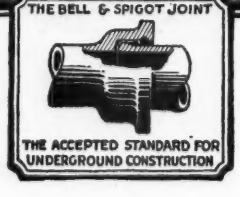
A Cast Iron Culvert—Cast Iron also gives remarkably long service for this use.

Address: RESEARCH ENGINEER

THE CAST IRON PIPE PUBLICITY BUREAU, PEOPLES GAS BUILDING, CHICAGO

CAST IRON PIPE

Our new booklet, "Planning a Waterworks System," which covers the problem of water for the small town, will be sent on request



Send for booklet, "Cast Iron Pipe for Industrial Service," showing interesting installations to meet special problems

ELECTRIC TIE TAMPING

For All Kinds of Ballast

No matter what kind of ballast is used, rock, gravel or a finer aggregate, Jackson Electric Tie Tampers can be used and will produce a far superior roadbed than can possibly be procured by hand tamping.

Electrical current is supplied by the Jackson Portable Power Plant, built in sizes suitable for the operation of 4, 8 and 12 tamping units. The small amount of space occupied by these plants enables placing them at any point along the roadway.

The illustrations show Jackson Electric Tie Tampers in operation on both rock and light ballast roadbeds and gives an idea of the portability of the Power Plant.

Write us for full description of both appliances.

ELECTRIC TAMPER & EQUIPMENT CO.

CHICAGO ILLINOIS

A *saving of* $3,000,000 in long distance charges

	N.Y.	CHI	St L	San F
N.Y.		$3.40	$4.05	$11.30
CHI	$3.40		$1.45	$8.25
St L	$4.05	$1.45		$7.80
San F	$11.30	$8.25	$7.80	

BY THE RECENT READJUSTMENT in long distance rates, it is calculated that telephone users will save $3,000,000 annually. Interstate and intersectional rates are substantially lower. The greater the distance, the greater the reduction. Here are typical station-to-station day rates, old and new: New York to Pittsburgh, formerly $2.10; now $1.70. Chicago to Boston, $5.45—$3.95. Atlanta to San Francisco, $13.65—$9.40.

IN ADDITION TO THESE nation-wide rate changes, several new service conveniences are offered. The privilege of "reversing the charges," for example, formerly applied only to person-to-person calls. This has now been extended to include station-to-station calls—a substantial saving and a real convenience to thousands of business men.

Those who wish to take advantage of the lowest long distance rates of the twenty-four hours may now do so beginning at 8:30 P. M. From this hour to 4:30 A. M., station-to-station rates are about fifty per cent of day rates. Now, more than ever, long distance calls are useful in the development of business. Thousands now use the telephone nationally. By telephone you can make a week's trip in a few minutes. Is there a distant call that would clear up some troublesome transaction? It probably would cost less than you think. . . . *Number, please?*

BELL LONG DISTANCE SERVICE

SAVE 60% OF YOUR LABOR AND TOOL COST

NOW IN USE ON OVER 100 RAILROADS

Showing Bar Set in Bottom Notch for First Throw

Showing Bars Set in Upper Notch for Second Throw

Combination Lining Bar

Heat Treated

Combination Tamping Bar

REASONS WHY YOU SHOULD USE HACKMANN COMBINATION TRACK LINERS

They will line track, frogs, switches, raise low joints and space ties.

Can be operated against the end of switch ties when lining turnouts and puzzle switches.

You can make at least two pulls without resetting the base.

Three to five men can now do the work formerly done by seven to nine men and seven men can do the work of fifteen to twenty men.

They will pay for themselves in a very short time in the saving of labor and tools.

Recent tests have shown that it is not necessary to resurface track when laying new rail on old ties. It has been found that the road bed is in better shape and more solid when not disturbed and in many cases will save this cost of resurfacing for some time to come.

Hackmann Combination Track Liner
Weight 20 lbs.

The lining and tamping bars are heat treated and the base is made of steel. Base weighs only 20 lbs.

Our track liners are made of only two parts. Nothing to get out of order; very little digging necessary to set liners.

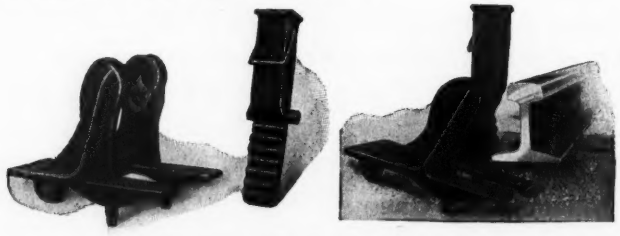
The use of these tools eliminate the constant use of other tools in connection with its performance.

Track lined with our liners remain in place longer than when lined with ordinary lining bars, as you do not disturb the roadbed.

More satisfactory results can be obtained with the Hackmann Track Liner than any other liner on the market.

WE ARE STUDYING YOUR PROBLEMS AND WILL GLADLY DEMONSTRATE OUR METHOD OF LINING TRACK ON REQUEST

Hackmann Idol Track Liner



Hackmann Duplex Track Liner

FOR USE WITH ANY ORDINARY LINING BAR

THE HACKMANN RAILWAY SUPPLY CO.

RAILWAY LABOR SAVING DEVICES—723 So. Wells St., CHICAGO, ILL.

FREDERICK HACKMANN,
President and Mechanical Engineer

J. J. FRANZEN,
Secretary and Treasurer

BALDWIN LOCOMOTIVE WORKS
Foreign Representatives

THE HOLDEN CO., Ltd., Canada
Toronto Montreal Winnipeg Vancouver

These ARMCO *culverts are still giving perfect service after 20 years of continuous use*

Armco quality your protection—

WHEN you buy an Armco culvert your money buys more than a mere metal of a certain weight, more than a mere drainage opening of a stated size, more than a piece of pipe to meet a certain specification. Your money buys what it cannot buy in any other product—Armco quality backed by Armco reputation and by Armco's considerate service in your interest:

Quality of Metal

Armco culverts are made from Armco Ingot Iron—the only commercially pure culvert metal made. In twenty years of service under every known condition of climate and soil it has not been found necessary to add any other ingredient to the composition of this metal or to alter in any way its analysis. Its superior rust resistive qualities have earned for it universal recognition as the Aristocrat of Culvert Materials.

Consistent Uniformity

The long life of Armco culverts is due not alone to the fact that the metal is pure; it is *uniformly* pure—the same composition of material year after year, installation after installation. In 95,454 analyses of Armco Ingot Iron, covering a period of seven years, the average variation in ferrous content was less than 2/10,000. This record of consistent uniformity is unequalled in the manufacture of iron and steel.

Proven Dependability

Armco culverts have been installed in every state in the Union and in every province of Canada continuously since 1907. Nearly 2,000,000 are now in use. The service rendered throughout the past twenty years by these culverts, many of them with repeated reinstallations in new locations, has supplied unmistakable proof of Armco dependability.

Quality Guarded by Nation-Wide Inspection

But Armco quality is due only in part to the happy discovery of a rust resistive iron. It is due as much to the jealous care with which the performance of Armco culverts has been watched for many years. Armco engineers are constantly in the field, examining, photographing, analyzing culverts. When a culvert gives less than its expected standard of service, these engineers ask why. Soils and ground waters are analyzed, and the abrasive qualities of the stream are studied. If the conditions noted are found to be of general occurence then Armco engineers do not rest until they have found a solution.

These investigations have served the double purpose of maintaining the supremacy of Armco quality and of assuring the culvert buyer a type of structure exactly suited to his requirements.

TRADE MARK ARMCO REG. U.S. PAT. OFF.

INGOT IRON

ARMCO CULVERT ASSOCIATION
MIDDLETOWN, OHIO

ARMCO CULVERTS

Consistent performance because of consistent uniformity

ABOVE: Kalamazoo 25-A Motor Car, seating capacity 12 to 24 men.

BELOW: Kalamazoo 17, seating capacity, 6 to 8 men.

Make KALAMAZOO Your Headquarters for All Maintenance of Way Equipment

You maintain a general headquarters, division headquarters and a headquarters for the distribution of supplies. Why not a headquarters, also, for the **manufacture** of supplies? Then you'd have responsibility **absolutely** pinned down.

Kalamazoo will cheerfully accept full responsibility as your headquarters for maintenance of way equipment—confidently believing that our careful manufacturing processes will never give you cause to regret placing the responsibility upon us.

The KALAMAZOO LINE

What It Means to You

The name **Kalamazoo** on any product has been a guarantee of quality for over forty years. From time to time, as rigorous tests proved them worthy, various products were added to our line until it is now one of the world's largest lines of railway maintenance of way equipment.

Here Is the Complete Kalamazoo Line—

Motor Cars—All Types
Hand Cars
Push Cars
Rail Cars
Velocipede Cars
Trailers
Tractors
Electric Crossing Gates
Pressed Steel Wheels
Wood Center Wheels
Track Drills
Levels
Gauges
Wood Cattle Guards
Steel Cattle Guards

The Most Complete Line of Motor Cars Made

The Kalamazoo Line of Railway Motor Cars includes every known type of car from one to thirty passenger capacities—also work cars, railway tractors and fully enclosed inspection or passenger models.

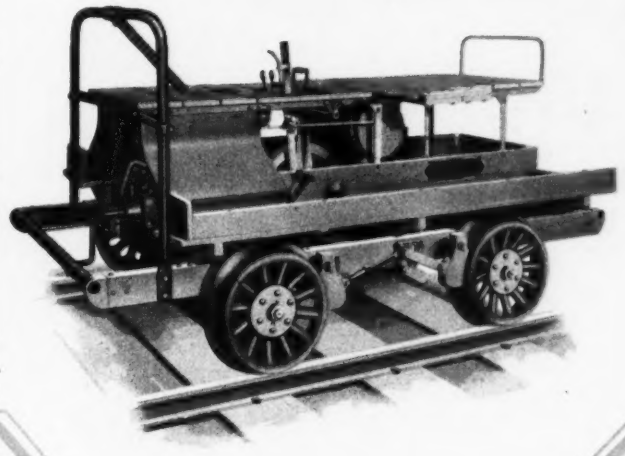
"Kalamazoo Means Service to You"

KALAMAZOO RAILWAY SUPPLY COMPANY

KALAMAZOO *Established 1884* MICHIGAN

New York, Chicago, St. Louis, St. Paul, New Orleans, Denver, Spokane, Seattle, Portland, Ore., Havana, London, Mexico City, Johannesburg, Vancouver, Winnipeg, Montreal

Sheffield 40-B



Sheffield 45

The same general construction as the famous "40-B," but slightly lower powered. Has 22 square feet of unobstructed deck space—the most tool space ever provided on a section motor car.

Sheffield 44

Foremost in the one-cylinder water-cooled class, with positive chain drive and clutch that won't burn out.

Sheffield 41

The leading center load car for roadmasters and linemen, signal service and engineering work.

Sheffield 32

Proved by more than 15 years of success to have the lowest maintenance cost of any section car ever built.

Foremost—
in the section motor car field

In superlative service—in downright dependability—the Sheffield 40-B has never been surpassed. Where the fine section motor car is demanded, this quality car is the final choice.

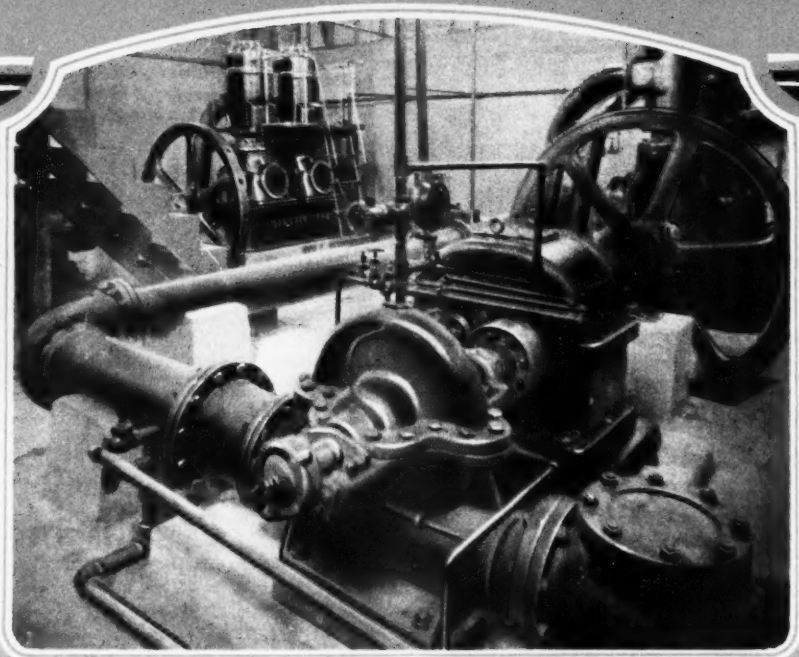
That it follows the best automotive construction is evidenced by features like three-point suspension of engine, automobile type pressed steel frame, and other refinements. The friction transmission has been greatly simplified. Large Timken taper roller bearings carry the drop-forged, heat-treated crankshaft, absorbing both radial and thrust loads. Engine is the improved four-cycle, valve-in-head design.

The "40-B" is simply the standard bearer for a wide range of F-M section motor cars that have been making history for more than thirty years.

Ask for complete description of any of the cars listed

FAIRBANKS-MORSE
MOTOR CARS

First on the rails and still first



Fairbanks-Morse installation in pumping plant of Atlantic Coast Lines R. R. at Waycross, Ga. The pumping units are 8-inch centrifugals, Diesel driven, having a total capacity of 3000 g. p. m.

F-M equipped *completely*

Is it the solution to your pumping station problem, too?

Surely no organization offers a wider range of pumping and power equipment for meeting every requirement of railroad pumping station service. Whether the individual pumping station calls for a Diesel-powered installation, such as the one illustrated above, or an automatic pumping station installation in which the principal units are motor-driven centrifugal outfits automatically stopped and started, or other combination of pumping and power equipment—the entire plant can usually be *completely* equipped without going outside the comprehensive Fairbanks-Morse line.

The advantage of having power, pumping and auxiliary equipment designed and built by one organization—and backed by one responsibility—is apparent. Hundreds of railroads today know its value in terms of dependable, efficient, economical operation.

Fairbanks-Morse service includes the co-operation of experienced engineers to assist in planning the most efficient layout for your purpose

FAIRBANKS, MORSE & CO., *Chicago*

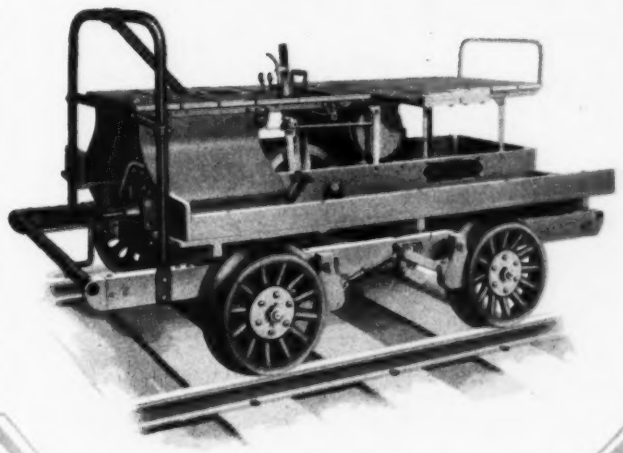
Manufacturers of Diesel engines, centrifugal and reciprocating pumps, electrical machinery, scales, complete coaling stations, tandpipes for water and oil, tank fixtures, motor cars, hand cars, push cars, velocipedes

FAIRBANKS-MORSE

DIESEL ENGINES · PUMPS MOTORS · SCALES

ARA21.12

Sheffield 40-B



Sheffield 45

The same general construction as the famous "40-B," but slightly lower powered. Has 22 square feet of unobstructed deck space—the most tool space ever provided on a section motor car.

Sheffield 44

Foremost in the one-cylinder water-cooled class, with positive chain drive and clutch that won't burn out.

Sheffield 41

The leading center load car for roadmasters and linemen, signal service and engineering work.

Sheffield 32

Proved by more than 15 years of success to have the lowest maintenance cost of any section car ever built.

Foremost—
in the section motor car field

In superlative service—in downright dependability—the Sheffield 40-B has never been surpassed. Where the fine section motor car is demanded, this quality car is the final choice.

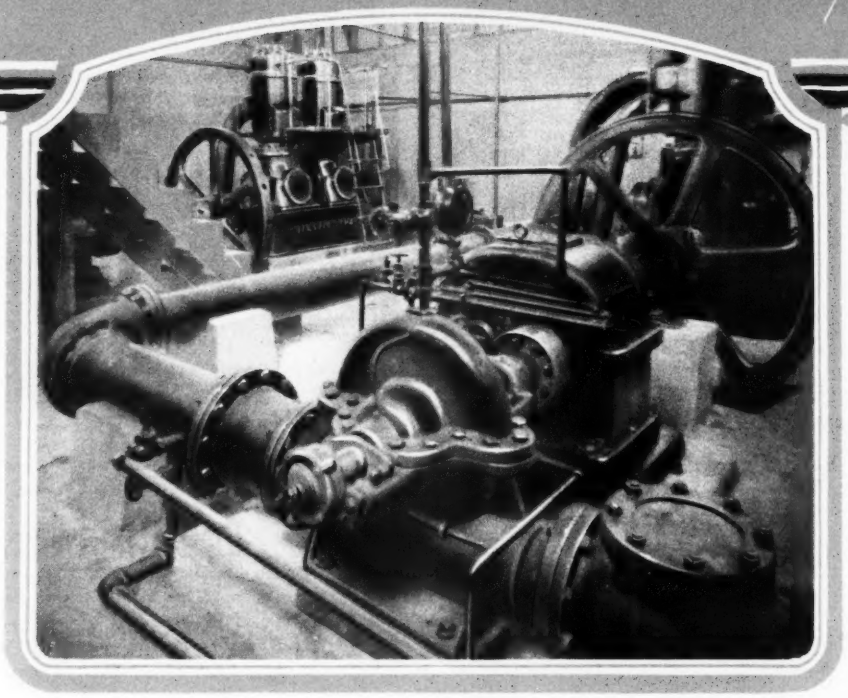
That it follows the best automotive construction is evidenced by features like three-point suspension of engine, automobile type pressed steel frame, and other refinements. The friction transmission has been greatly simplified. Large Timken taper roller bearings carry the drop-forged, heat-treated crankshaft, absorbing both radial and thrust loads. Engine is the improved four-cycle, valve-in-head design.

The "40-B" is simply the standard bearer for a wide range of F-M section motor cars that have been making history for more than thirty years.

Ask for complete description of any of the cars listed

FAIRBANKS-MORSE
MOTOR CARS

First on the rails *and still first*



Fairbanks-Morse installation in pumping plant of Atlantic Coast Lines R. R. at Waycross, Ga. The pumping units are 8-inch centrifugals, Diesel driven, having a total capacity of 3000 g. p. m.

F-M equipped *completely*

Is it the solution to your pumping station problem, too?

Surely no organization offers a wider range of pumping and power equipment for meeting every requirement of railroad pumping station service. Whether the individual pumping station calls for a Diesel-powered installation, such as the one illustrated above, or an automatic pumping station installation in which the principal units are motor-driven centrifugal outfits automatically stopped and started, or other combination of pumping and power equipment—the entire plant can usually be *completely* equipped without going outside the comprehensive Fairbanks-Morse line.

The advantage of having power, pumping and auxiliary equipment designed and built by one organization—and backed by one responsibility—is apparent. Hundreds of railroads today know its value in terms of dependable, efficient, economical operation.

Fairbanks-Morse service includes the co-operation of experienced engineers to assist in planning the most efficient layout for your purpose

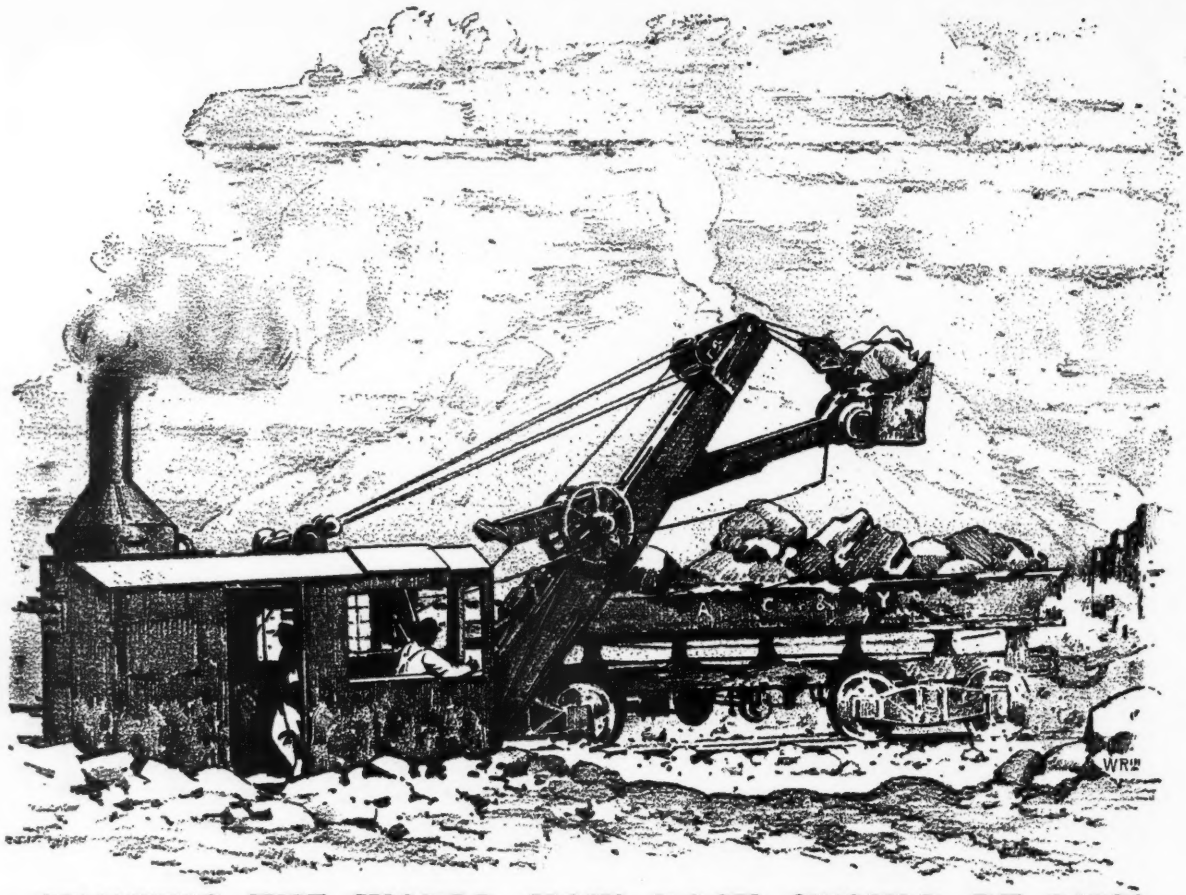
FAIRBANKS, MORSE & CO., *Chicago*

Manufacturers of Diesel engines, centrifugal and reciprocating pumps, electrical machinery, scales, complete coaling stations, tandpipes for water and oil, tank fixtures, motor cars, hand cars, push cars, velocipedes

FAIRBANKS-MORSE

DIESEL ENGINES · PUMPS MOTORS · SCALES

ARA21.12



SHOWING THE WORLD HOW ROCK SHOULD BE DUG!

(A story of the Akron, Canton & Youngstown Railroad's McMyler-Interstate Shovel).

Down in Akron, last month, the A. C. & Y. discovered the real digging ability of their McMyler-Interstate 1-yard steam shovel while cutting a road bed thru rock. Here's the way Mr. Watkins, Engineer Maintenance of Way, tells the story

"We had put another make steam shovel on the job and it could not dig the rock. Our McMyler-Interstate shovel was working in fairly soft ground at that time, but we were so impressed with the performance that we gave it a try on the rock cut. Our confidence was certainly well placed. The ease and speed with which it handled the rock was a surprise, and the shovel finished the project in very good time, standing up 100% under the hard digging".

This digging ability can easily be explained—a bigger boiler than other 1-yard shovels—bigger engines—full manganese steel dipper, and sturdier boom construction.

Sooner or later you will switch to McMylers, because they are *built to build your business.*

Let us send you a copy of bulletin 79.

Cranes and Shovels
Crawler Tractor
Locomotive
Gas Electric
Steam
Clam-shell Buckets

C-2-150

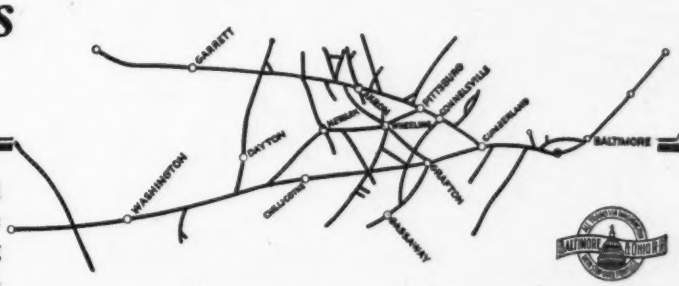
McMyler-Interstate

CLEVELAND, OHIO

B. & O. Division Points

ARE EQUIPPED WITH

Matthews Mechanical Painting Equipments



The illustration above shows the division points on the B. & O. equipped with Fig. 105 Matthews Mechanical Painting Equipments

Two No. 105 Matthews Mechanical Painting Equipments used for twelve months on Maintenance-of-Way painting on the Baltimore division of the B. & O. Railroad revealed a saving of approximately 40%. Based on this performance 13 additional Matthews Mechanical Painting Equipments were bought and placed at various other division points. The showing to date has been most satisfactory.

Isn't such evidence conclusive proof of the superiority of Matthews Mechanical Painting Equipments? They are built to stand the wear and tear of heavy duty, giving dependable service day after day. Each part of a Matthews Equipment has been made standard only after thoroughly demonstrating its ability to function perfectly in relation to the other elements in the unit. From the guns down to the engine that drives the compressor, Matthews Equipments have proven time and again that they can be depended upon to furnish a constant air pressure up to 90 pounds, absolutely free from oil or moisture in the air lines, on every type of the most difficult maintenance work.

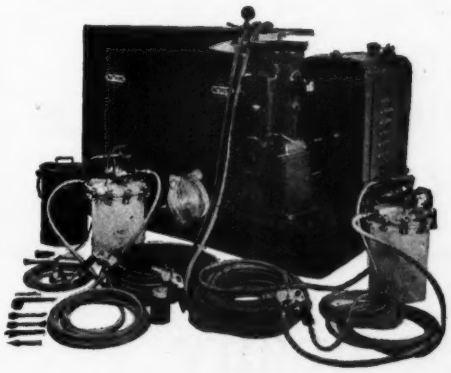


Fig. 105 *Complete two unit with heavy duty equipment. Air capacity sufficient to operate three units or one rotary wire brush.*

The Matthews Gun

Of particular importance is the Matthews Gun which has the exclusive "air envelope" feature for reducing fog and mist to a minimum. It permits the use of practically any material that can be applied with a brush. Often it reduces the number of coats required. Perfectly balanced, light in weight and having a comfortable Bakelite pistol grip, it is overwhelmingly preferred by workmen everywhere. Easily cleaned, quickly adjustable from a spot the size of a dime to a 12 inch fan stroke.

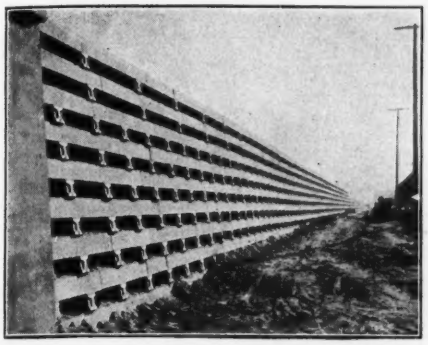
Get This Interesting Booklet

"Mechanical Painting for Maintenance" is a 12-page booklet that will answer many of the questions you want to ask about your painting problems. Tells about mechanical painting in general. Gives comparative costs on brick, corrugated iron, stucco, weatherboard, shingle roofs, tanks and all kinds of interior surfaces. Gives full information regarding the different kinds of materials handled and how to select them. Shows photographs of different equipments and close-ups of various units in their make-up. Gives extracts from 14 letters received from prominent manufacturers regarding their experience. Has a page of questions and answers. Tells about the instruction given your men and the service you can expect. Send for this booklet today.

W. N. MATTHEWS CORPORATION
3700 Forest Park Blvd. . . . . St. Louis, Missouri

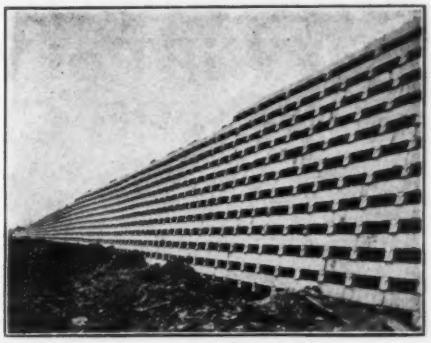
MATTHEWS
MECHANICAL PAINTING
EQUIPMENT

Some R. C. Retaining Wall Installations in 1926



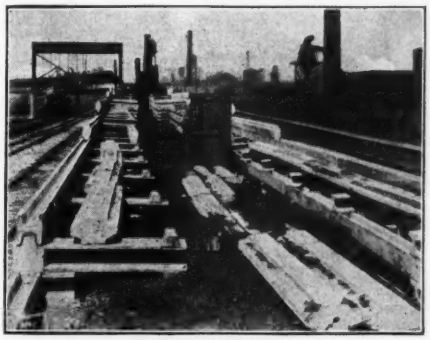
1926 was a great year for precast concrete cribbing. Engineers and contractors are discovering that this type of construction saves money, and gives superior results. R.C.Units haveled in this advance—as these typical installations show.

For the Wabash
An R. C. Wall built under severe winter conditions in Detroit.



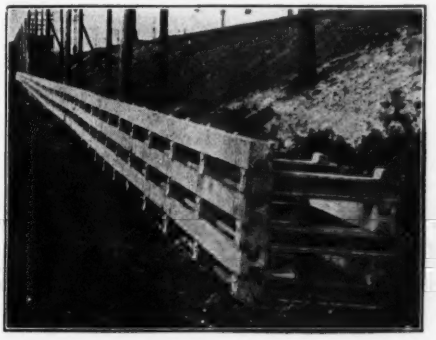
Cleveland Electric Illuminating Co.
Built in January at the Avon Power Plant.

They Cut the Cost 50 Per Cent

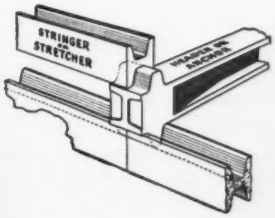


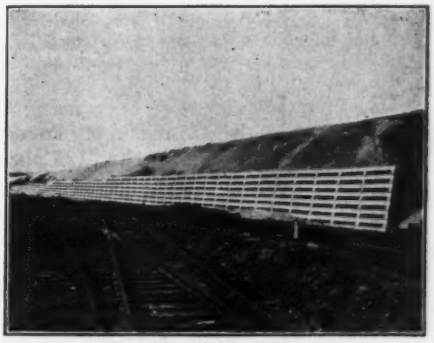
C. B. & Q. Railroad
At Western Ave., Chicago. A steep grade and sharp curve. R. C. Wall, built 1 inch from edge on top of concrete wall, supports heavy service engines.

R. C. Units are 100% adaptable to your cuts and fills. No detail designs are necessary. Common labor places the units and follows with the backfill. No waiting for walls to set. No forms to build and tear down. No wonder you save time and cost. ¶Use the *safe* units—R. C. Units—made of the best wet-process concrete, reinforced with steel. Our engineers will cooperate with you without charge.



Illinois Central
At 91st St., Chicago. R. C. Wall built for 10c a sq. foot.





Illinois Central
R. C. Wall at 22nd Street Chicago

SEND FOR THIS FREE BOOK

The R. C. Book contains illustrations of many typical installations—gives comparative cost figures—shows wall details and gives standard specifications. Also other useful information. Write for a copy—for present use or for your files.

1. **No Skilled Labor Required.**
   R. C. Units automatically interlock and square away.
2. **No Mason Work**
   No dowels, fittings, pillow or filler blocks.
3. **No Drainage Problems**
   And no massive foundations.
4. **No Salvage Loss**
   R. C. Construction is permanent or 100 per cent salvageable
5. **Assured Results**
   R. C. Units can be specified as definitely as structural steel.

THE R. C. PRODUCTS COMPANY, Inc.
ENGINEERS BUILDING, CLEVELAND, OHIO
New York Chicago Norfolk Indianapolis San Francisco

REG. U.S. PAT. OFF.
PRODUCTS
PRECAST RETAINING WALL UNITS

The R. C. Products Co., Inc.
Engineers Bldg., Cleveland, Ohio

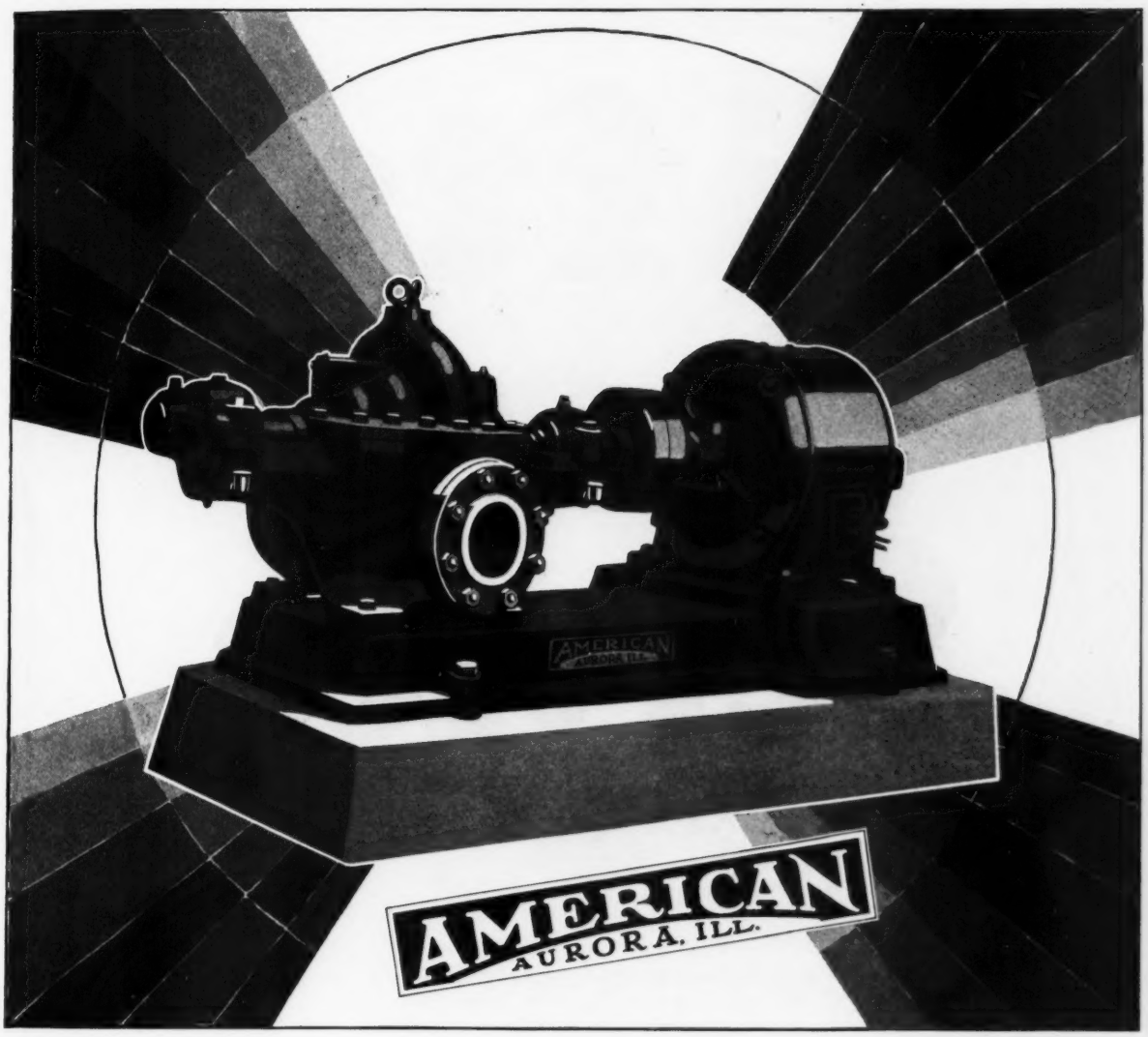
Send me your *free* book of Retaining Wall Data ☐
Also complete information on the use of R. C. Units for the following purposes_____

_____

*Company Name*_____

*Individual's Name*_____

*Address*_____



THE American" type DSMD centrifugal pump is a horizontal split shell, single stage, double suction, centrifugal pump furnished with bronze enclosed impeller, bronze labyrinth wearing rings, bronze shaft sleeves and bronze split glands.

Pump is mounted on extended cast iron base to receive motor and is provided with flexible coupling of the pin and bushing type for direct connection to motor.

Pump is of the double suction type and is built in sizes from 2" to 42" and for designed heads up to 250' depending upon size and capacity.

The bearings of the pump are entirely separate from the stuffing boxes which eliminates the possibility of any grit or water in the bearing. The oil reservoirs in the bearing are large, furnishing an ample supply of oil. The stuffing boxes are water sealed so as to insure tight packing without excessive pressure for friction on the revolving shaft.

THE AMERICAN WELL WORKS

Branch Offices:
Chicago, Ill., First Natl. Bank Bldg.
Milwaukee, Wis.
Wisconsin National Bank Bldg.
New York, N. Y.... 165 Broadway
Dallas, Texas
Western Indemnity Bldg.
San Francisco, Calif., 635 Mission St.

District Sales Agencies:
Philadelphia, Pa.
Pittsburgh, Pa.
Cleveland, Ohio
Detroit, Mich.
St. Paul, Minn.
Omaha, Nebr.
St. Louis, Mo.
Kansas City, Mo.
Joplin, Mo.
Atlanta, Ga.
Birmingham, Ala.
Jacksonville, Fla.
New Orleans, La.
Roswell, N. Mex.
Denver, Colo.
Salt Lake City, Utah
Phoenix, Ariz.
Los Angeles, Calif.
Charlotte, N. C.
Calgary, Alta., Can.

General Office and Works:
AURORA, ILL.

SESQUI-CENTENNIAL INTERNATIONAL EXPOSITION PHILADELPHIA 1926

Medal of Honor

for

deLavaud Centrifugal Cast Iron Pipe

THE international jury of awards of the Sesqui-centennial accorded the highest award to deLavaud centrifugal pipe.

This official recognition of the advance that the deLavaud process has brought into the pipe industry will be significant to all engineers and construction experts.

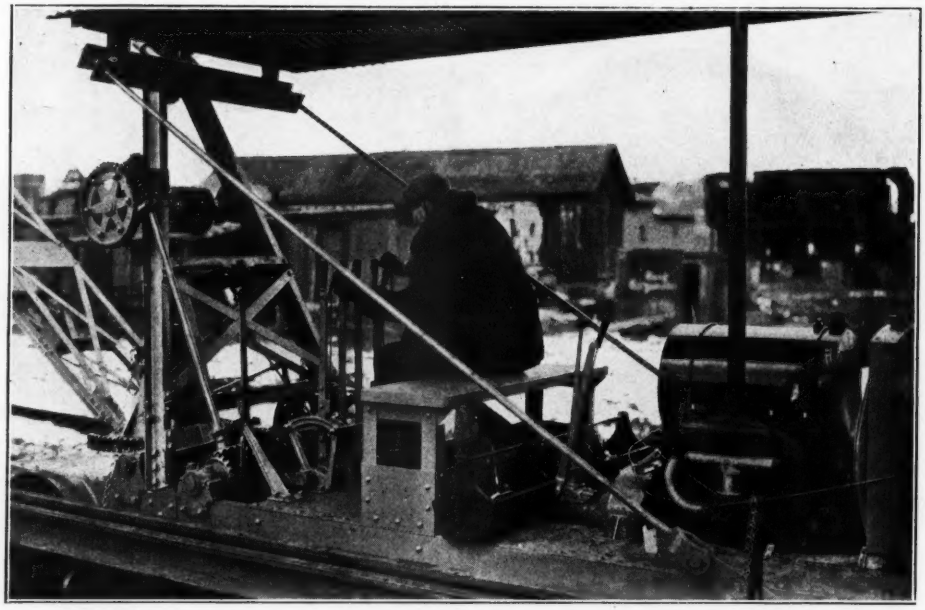
Write for special literature covering the specifications, manufacture and use of deLavaud Centrifugal Cast Iron Pipe.

United States Cast Iron Pipe and Foundry Company

SALES OFFICES

Philadelphia: 1421 Chestnut St.
Chicago: 122 So. Michigan Blvd.
Birmingham: 1st Ave. & 20th St.
Buffalo: 975 East Ferry Street
Cleveland: 1150 East 26th Street
New York: 71 Broadway
San Francisco: 3rd & Market Sts.
Pittsburgh: 6th & Smithfield Sts.
Dallas: Akard & Commerce Sts.
Kansas City: 13th & Locust Sts.
Minneapolis: 6th St. & Hennepin Ave.

General Offices:
Burlington, New Jersey



Rail-Laying Made SAFER

Safer Than Ever Before, and 56% Faster With the Parsons Rail Crane

Down She Goes

No worry here about having each man let go at the right time. No danger of strains, or ruptures. The operator has the Rail Crane under such perfect control that a walnut, placed between the rail and the tie plate, can be cracked without being smashed.

THE Parsons Rail Crane has increased the safety of rail-handling for two important reasons:

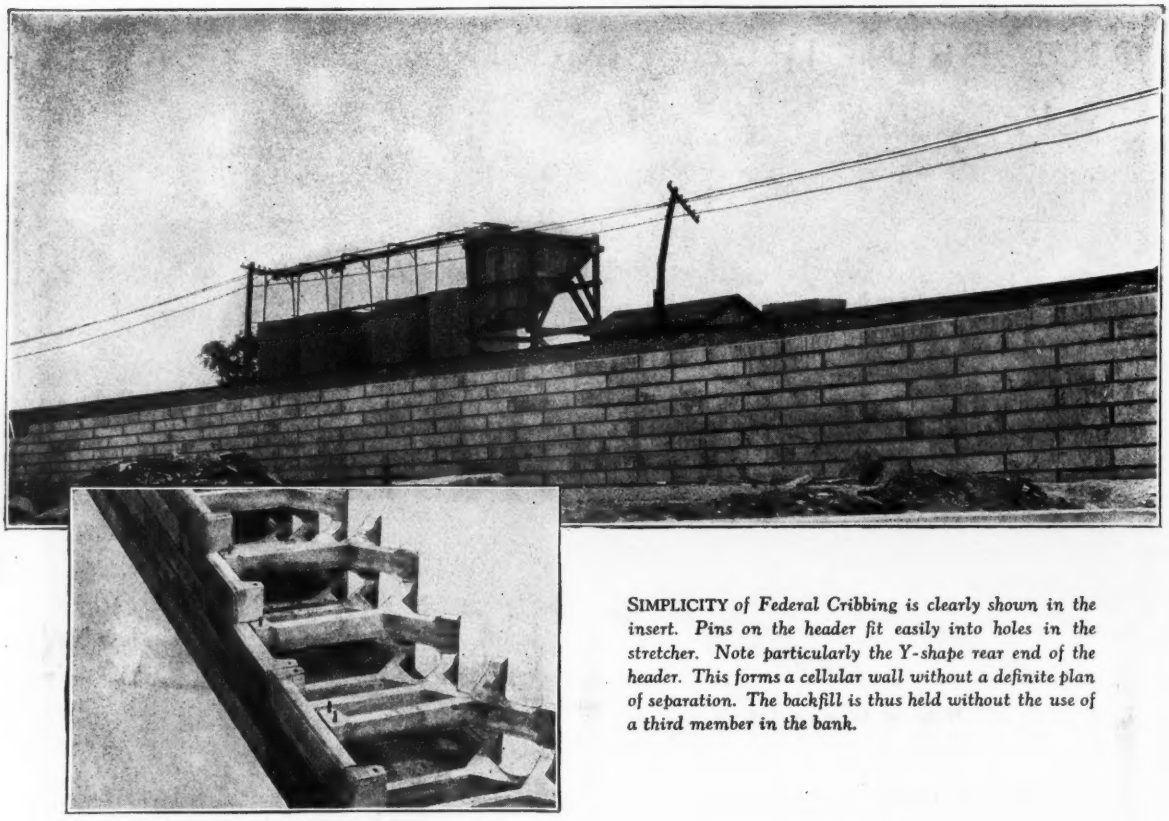
1. Every step of the work is in full view of the operator. The open design of the A-frame at the front end of the Rail Crane gives the operator a clear view of the rail and the men who are handling it, from the time it is picked up until it is lined into place, ready for spikers and adzers.

2. Every operation of the Crane is under instant, positive control. The worm-and-worm-gear that swing the boom, keep it automatically locked whenever at rest. (No danger of a rail swinging wild.) All levers are within easy reach of the operator. The Rail Crane speeds up rail laying by more than 50 per cent (56 per cent according to official figures). And, still more important, the Rail Crane is an effective safeguard against rail-laying accidents to maintenance-of-way employees—accidents that totaled more than 10,000 in 1924.

The Rail Crane deserves your thorough investigation. Send for list of officials who are using Rail Cranes, and for copy of our new booklet, "The Modern Way To Handle Rail," sent free to railroad men. Write for your copy today.

THE PARSONS COMPANY, Newton, Iowa, U. S. A.

PARSONS RAIL CRANE



SIMPLICITY *of Federal Cribbing is clearly shown in the insert. Pins on the header fit easily into holes in the stretcher. Note particularly the Y-shape rear end of the header. This forms a cellular wall without a definite plan of separation. The backfill is thus held without the use of a third member in the bank.*

The backfill can not filter through

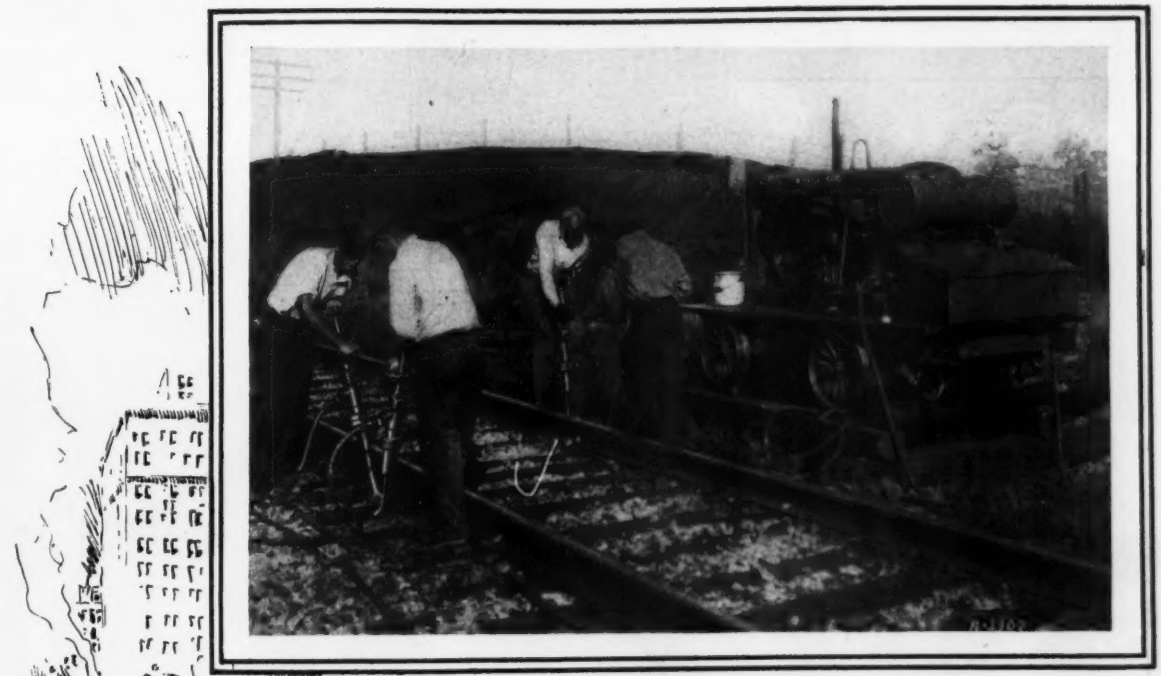
FEDERAL Concrete Cribbing assures a retaining wall of strength and durability with the fine appearance of good masonry. It forms a closed-face wall. The only openings are one-inch continuous slots which provide free drainage. The backfill can not filter through, and vegetation can not secure a foothold.

For further information write to

FEDERAL CEMENT TILE COMPANY

608 South Dearborn Street, Chicago, Illinois

FEDERAL CONCRETE CRIBBING



Pneumatic Tampers

make a firmer and more permanent road bed

More track can be tamped per day, and a more uniform roadbed obtained, when pneumatic tie tampers are used. Full tamping power is available all day long.

Four men with pneumatic tampers will tamp more track per day, and do a better job, than ten to twelve men using hand methods.

An Ingersoll-Rand Portable Air Power Unit for tie tamping, rail bonding, rail bolting, bridge repair, concrete breaking, drilling, etc., effects a surprising reduction in the time and cost of the work. An investigation of these air power units will show many ways to reduce track costs. Ask for complete information.

INGERSOLL-RAND COMPANY—11 BROADWAY, NEW YORK CITY

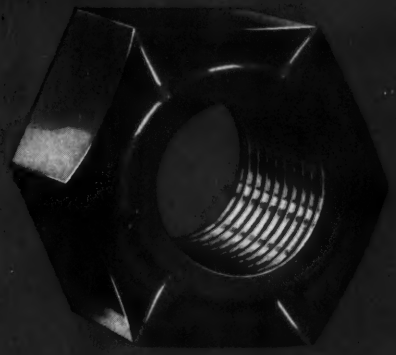
Offices in principal cities the world over

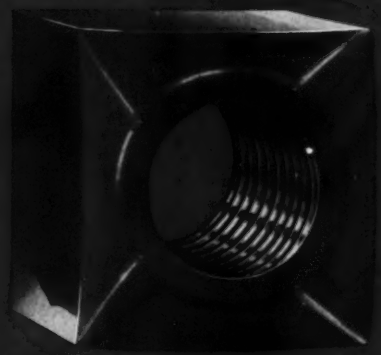
FOR CANADA REFER—CANADIAN INGERSOLL-RAND CO. LIMITED, 260 ST. JAMES STREET, MONTREAL, QUEBEC.

234-TT

Ingersoll-Rand

after 53 years search we present SELFLOCK UNIT NUTS





"The Nut with the Star Crown"

During these many years of search—we were super-critical. We wanted a self-contained nut that would lock positively and stay locked under the hardest conditions of railroad application.

We were guided by a thorough knowledge of the faults and advantages of every so-called lock nut yet produced.

After discovering the unique scientific principle of the Selflock Unit Nut, we tested and experimented with it for years before putting it on the market.

Today it is a thoroughly proved and perfected product—a nut that will keep a tight unyielding grip regardless of the most racking vibration. It locks on every thread.

GRAHAM BOLT AND NUT COMPANY

PITTSBURGH, PA.

ESTABLISHED 1874.

SELFLOCK UNIT NUTS

hold tight under all conditions of vibration no matter how severe!

Your Railroad can Profitably Use Selflock Nuts on

1. **Locomotives**
2. **Rolling Stock**
3. **Track Bolts**
4. **Frog and Crossing Bolts**
5. **Shop Machinery and Equipment**

"They lock on every thread"

Write for particulars—

Graham Bolt and Nut Company

Pittsburgh, Pa.

KYROCK PLATFORMS ON A. C. L. R. R. AT FLORENCE, S. C.

New Platforms at 76c Sq. Yd.

Write Today for the Complete Story

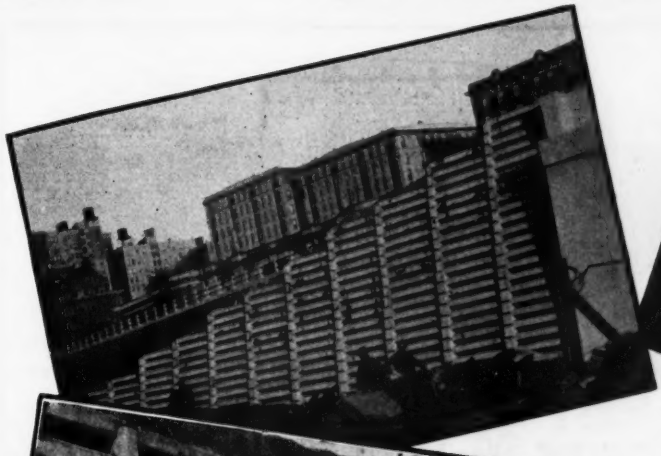
How the A. C. L. R. R. built new platforms of "Kyrock" at Florence, S. C., at 76c per square yard is graphically told by a series of photographs showing the surprisingly few and simple operations involved. May we send you a copy?

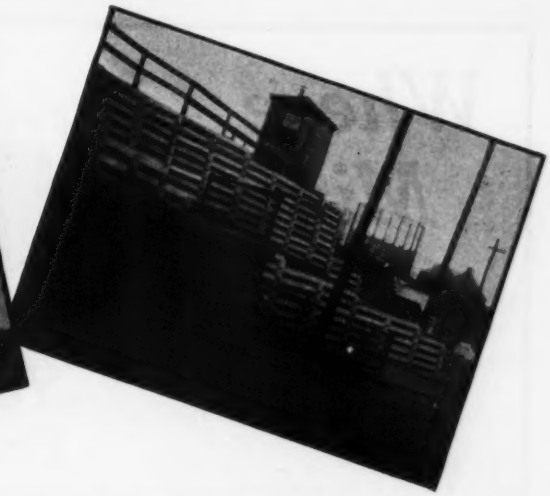
KENTUCKY ROCK ASPHALT CO., Incorporated, LOUISVILLE, KY.

Kyrock

The Perfect Pavement

KENTUCKY ROCK Kyrock ASPHALT





BIG WALLS

Little walls Short walls
Long walls
Any kind of walls

MASSEY Reinforced Concrete Cribbing Walls built up of only two standard units are easily adaptable to the wide variety of wall problems met in railroad construction and maintenance work. Curves, offsets, recesses, stepped ends—all these and many other special requirements in wall construction can be provided with Massey Type H Cribbing at minimum cost and with no appreciable trouble or delay.

Such walls are applicable not only for locations where permanence is the first essential but equally so where a change in location or abandonment of the wall may become necessary at any time. For temporary use the crib wall is ideal as the units may be used over and over without any great depreciation. Massey Cribbing thus makes possible a flexibility in construction work unknown with monolithic walls. It has proved its stability, permanence and economy. This added advantage of convenience should be obvious. Let Massey engineers consult with you on retaining wall problems.

Catalog Supplement 20 contains interesting service data. A copy on request.

MASSEY

Concrete Products Corporation, Peoples Gas Building, Chicago

Sales Offices: New York, Atlanta, Cincinnati, St. Louis, Los Angeles

Canadian Concrete Products Co., Ltd. Transportation Building, Montreal, Que.

Massey Cribbing is produced in the same plants and is of the same high quality as Massey Culvert Pipe and other precast concrete products which have been standard construction on the leading railroads for years.

REMI-Gray

Railway
Engineering and Maintenance

Volume 23 January, 1927 Number 1

1926 A Successful Year—What of 1927?

THE YEAR which has just closed was a highly successful one from the standpoint of the engineering and maintenance of way departments. The year was devoid of serious floods and storms and was unusually free from labor disturbances. More work was done than in any recent year and the properties are now in the best physical condition in their history.

To the maintenance of way department is due no small part of the credit for the remarkable efficiency displayed by the roads in the movement of the heaviest traffic in their history without congestion or delay and with a marked improvement in operating efficiency. Through its efforts the tracks and structures were so maintained that the traffic was handled with the minimum delay due to derailments, slow orders or other defective roadway conditions. It has been said with truth that a railway resembles a giant machine in which the operations of every department must mesh in gear with every other department to produce a smooth running operation. This was done by the maintenance of way department in 1926 more perfectly than ever before.

The Work Done

One measure of the year's results is the amount of work done. In additions and betterments, the Bureau of Railway Economics reports that the Class I roads of the United States alone spent $875,000,000 last year, $127,000,000 more than in 1925 and slightly more than in 1924. Of this amount, however, $495,000,000, or 57 per cent, went for roadway and structures last year as compared with $410,000,000, or 55 per cent of the total in 1925 and $381,000,000, or 44 per cent in 1924. While the total amount spent for all improvements in 1926 was $175,000,000 less than in the record year of 1923, the amount spent on roadway and structures last year actually exceeded that in 1923 by $118,000,000 and established a new record for volume of improvement work in this department.

A similar condition prevailed in maintenance of way work. During last year $872,000,000 was expended for the repair and upkeep of the fixed property as compared with $825,000,000 in 1925 and an average of $790,000,000 during the five years, 1921-1925, inclusive. In other words, while the total operating expenses of the railways were slightly higher in 1926 than in 1925 or the average of the five preceding years, 18½ cents of every dollar of operating expenses went for maintenance of way last year as compared with 17 cents during the five year period preceding.

As a result of these expenditures the fixed properties are now in better condition than in any previous year. Not only are they better constructed and more adequate for the needs of traffic, but they are better maintained. In most instances the wartime deterioration was overcome prior to the beginning of 1926 and as a result the work done last year has brought them to the highest standards in history. By this it is not intended to convey the impression that there is no longer a large amount of work to be done which will yield large returns on the expenditure but rather that more of this has been done of late than ever before.

The Wear and Tear of Traffic

Since the amount of roadway repair required depends in part on the amount of traffic handled, it is of interest to note that the tonnage handled exceeded that in any previous year. The number of cars loaded with revenue freight during 1926 totaled 53,309,644, which was an increase of 2,085,492 cars, or 4.1 per cent, over the highest previous record, established in 1925. Likewise, the maximum number of cars loaded in any week established a new record in 1926 when during the week ending November 1 1,216,432 cars were loaded. In view of the fact that prior to 1920 the freight loadings never reached a million cars in any single week and that there were only five million-car weeks prior to 1923, it is of interest to note that the average number of cars loaded per week *throughout* 1926 exceeded 1,000,000. Measured in ton miles, the traffic last year exceeded 447,000,000,000, an increase of 31,000,000,000, or 7.4 per cent, over 1923, the previous record year in this respect.

While the mileage of main tracks has increased somewhat from year to year it has not, of course, kept pace with the development in traffic, with the result that the traffic density per mile of main tracks or the service exacted is increasing. This is shown by the fact that the revenue ton miles handled per mile of main track have risen from 958,000 in 1910 to 1,393,000 in 1920 and to 1,482,000 in 1926.

The tendency to increase the speed of trains has also continued throughout the year. While the increase in the average mileage per freight car per day made in recent years is primarily the result of the reduction in the time cars are standing, it is influenced also by the faster speeds while in motion. The average movement of freight cars per day for the first ten months of 1926 was 30.4 miles as compared with 28.2 miles for the corresponding period of 1925.

The service required of the track has also become

more severe by reason of the constantly increasing weight of cars and locomotives. Thus, in the ten years from 1915 to 1925 the average capacity of freight cars in service rose from 39.8 tons to 44.8 tons, while the average tractive power of locomotives increased from 31,840 lb. in 1915 to 40,666 in 1925. In contrast there was a slight decrease in the average load per freight car in 1926 (to October), 27.2 tons, as compared with an average for the five years preceding of 27.3 tons. As a whole, however, the combined effect of locomotives, cars and lading has been to produce higher unit loadings and thereby increase the severity of the effect on the track.

The Labor Situation

The past year was noteworthy because of its freedom from labor disturbances. Also, although the average number of men employed in maintenance of way work during the first nine months of the year was larger by 28,400, or seven per cent, than for the corresponding period last year, there was an adequate supply of labor at practically all points throughout the year and the turnover was, if anything, less than usual. As a result, the efficiency of the forces was at a higher level than at any time since the outbreak of the war.

The use of labor saving equipment has increased steadily during the year. In the main this increase has come through the more general adoption of equipment whose economy has already been demonstrated, such as ditchers, spreaders, tie tampers, rail laying machines, track liners, etc. It has also been evidenced through the introduction of newer or more versatile equipment, such as portable power units. A development of particular interest during the last year has been the refinement in motor car design evidenced by the introduction of a number of modifications in earlier construction, intended to increase the efficiency, reliability and versatility of their operation. Another development of much promise may be expected from the increased attention that manufacturers and railway men have given to the perfection of equipment for the cleaning of ballast, a task that is assuming large proportions with the increasing use of crushed stone and the placing of greater emphasis on the maintenance of adequate drainage in this ballast.

More Attention to Programming

More attention has been given to the utilization of labor during the last year than ever before. Programs have been prepared more carefully and on an increasing number of roads the work is being scheduled in greater detail for section as well as extra gangs to give these gangs an objective and to enable supervising officers to determine readily if they are making proper progress. Indicative of the trend in this direction was the step taken by at least one large road during the year to reorganize its rail laying operations on a system rather than a division basis, by means of which it has been able to reduce the number of gangs and to give them better supervision and thus secure increased production.

Progress has also been made in the stabilization of forces. The waste that results from the breaking up of organizations and the laying off of men each fall is becoming more generally realized and this is providing an incentive for efforts to eliminate this drain. Out of these studies is coming the realization of the fact that it is possible to do more work in the slack winter season than has been generally believed to be feasible. This is brought out in a striking manner in an article describing the progress that the Delaware & Hudson has made in the reduction of the sags and peaks in its forces and the results that have been secured therefrom, which is published on page 13 in this issue.

In large measure the stabilization of forces is being accomplished by transferring rail relaying and similar operations from the summer to the winter. That this practice is growing rapidly is best indicated by the increasing volume of orders for rails that are being placed in the fall for delivery during the early winter months, in contrast with the practice of a few years ago when few orders were placed until the late winter. While it is not contended by most advocates of this practice that rail can be laid more cheaply in the winter than in the summer, it has been demonstrated that much of this rail can be laid with forces that would otherwise be occupied largely in non-productive work and that the many incidental advantages of having a trained force available to meet emergencies and of having rail laying and other operations completed before the spring rush comes effects large economies in the end.

A Stronger Track Construction

The increasingly severe demands that are being imposed on the track and structures by the operation of more and heavier cars and locomotives are reflected in the continuous program for the strengthening and replacement of bridges. The increasingly heavy loads are also showing the necessity for a heavier track construction, both to carry the traffic safely and to reduce the deterioration and resulting high cost of maintenance of the tracks themselves. This is illustrated by the steadily increasing use of rails of heavier sections. Thus, in 1925 a total of 1,637,631 tons, or 59 per cent of the rails rolled in the United States, were of 100-lb. section or heavier, in contrast with which only 688,995 tons, or 31 per cent of the total rolled, were of these weights in 1915. The trend in this direction has been particularly pronounced during 1926 and the final figures, when available, may be expected to show two-thirds of the total tonnage in the past year to have been of 100-lb. sections or heavier.

The same tendency to strengthen the track is shown by the increasing use of ballast. While the traffic on many lines is so light that other than the cheapest materials are not warranted, these materials are giving way in turn to cinders, gravel and broken stone as the traffic becomes heavier. More than 10,000 miles of main tracks were ballasted last year and reports from representative roads indicate that at least an equal mileage will be ballasted this year. Likewise, the use of larger and better manufactured ties is more general, while the percentage of treated ties installed in 1926 rose to about 65 per cent. Of equal interest is the fact that adoption of and adherence to the standard specifications of the American Railway Engineering Association is progressing which, in itself, is resulting in better ties and in larger ties for the grades specified.

The outstanding development in the direction of the strengthening of the track construction during the last year was the completion and placing in service of a quarter-mile section of concrete roadbed on the Pere Marquette. This installation, which is described on page 5, is a radical departure from exist-

ing practices of track design in that it substitutes a continuous rigid support for a more or less resilient subgrade and ballast. It is the most important experiment in the design of track undertaken for years and deserves careful attention.

Material Prices Stationary

While the railways spent more money for materials for use in engineering and maintenance of way work last year than ever before, prices as a whole were stationary or tending towards slightly lower levels. Aside from rails which have been held at an arbitrary base price of $43 per ton since 1922, other steel products used in quantity, such as track bolts, track spikes, tie plates and wire nails, showed almost as little fluctuation, with such changes as occurred in the downward direction. Lumber showed the same steadiness with a few items such as pine stringers rising slightly late in the year as Douglas fir stringers declined. Quotations were held steady by the curtailment of production on the part of the mills.

Conditions in the tie market have been more spotted. Because of the constantly increasing proportion of ties treated, the tie market is less indicative of current needs since ties must be purchased a year or more prior to insertion to permit them to be seasoned and treated. Fluctuations in the demand result in large part by reason of the latitude thus afforded purchasers, with the result that the roads not infrequently withdraw from the market so generally that production is discouraged and then return to find that they must bid up prices to stimulate manufacturing. As a whole the railways were backward in contracting for their full requirements during the last year, with the result that production has been at a low ebb, a condition which may lead to higher prices if the roads enter the market this year with inquiries for normal requirements.

The Outlook for 1927

In spite of the record breaking activity during 1926, the outlook for 1927 is for a continuation of improvement and maintenance work at this same rate. The Railway Age, in its issue of January 1, estimated that the roads will spend between $750,000,000 and $900,000,000 of new capital for additions and improvements to their properties, exclusive of current repairs and maintenance, during 1927. This compares with an actual expenditure of $875,000,000 for improvements last year. Railway and industrial leaders are of the opinion that the volume of traffic will approximate that of last year and earnings, may therefore, be expected to continue at a high level.

Among the larger budgets which have been announced are those of the Chesapeake & Ohio for $55,254,674; the Chicago & North Western, $38,000,000; the Southern Pacific, $37,100,000; the Norfolk & Western, $23,315,000; the Chicago, Burlington & Quincy, $23,000,000; the St. Louis-San Francisco, $21,622,089; the Great Northern, $17,500,000; the Delaware, Lackawanna & Western, $14,845,000; and the Reading, $13,254,739. These budgets indicate that the roads as a whole will spend more than $75,000,000 in 1927 for the construction of more than 1,000 miles of new lines; more than $50,000,000 for the construction of over 600 miles of second and other multiple main tracks; approximately $60,000,000 for new terminal facilities; $35,000,000 for shops and shop equipment; between $10,000,000 and $15,000,000 for signaling and interlocking facilities; nearly $50,000,000 for grade separation and more than $100,000,000 for a wide variety of miscellaneous roadway improvements.

With prospects for the continuation of heavy traffic and for liberal expenditures for roadway improvements, it is reasonable to expect that expenditures for maintenance and repair will be equally liberal. In fact, the orders for rails that have been placed so far are somewhat larger than those of the same roads last year, while the budgets indicate that at least as great a mileage of track will be relaid this year as in 1926, while a slightly greater mileage of tracks will be reballasted. In brief, all indications point to the continuation of the present active maintenance program during this year.

Changes in Personnel

The year 1926 saw the promotion of many officers of engineering training into operating and executive positions. Division engineers were promoted to division superintendents, and engineers of higher rank were promoted to general managers, vice-presidents and presidents. Among engineering officers so recognized during last year were L. A. Downs, president of the Illinois Central; N. L. Howard, president of the Chicago Great Western; J. J. Pelley, president of the Central of Georgia; E. H. Lee, president of the Chicago & Western Indiana; Elisha Lee, senior vice-president, and M. W. Clement, operating vice-president of the Pennsylvania System; H. M. Lull, executive vice-president of the Southern Pacific, Texas and Louisiana Lines; E. M. Durham, Jr., vice-president of the Missouri Pacific; A. R. Raymer, assistant vice-president of the Pittsburgh & Lake Erie; L. B. Allen, assistant to vice-president, Chesapeake & Ohio; R. E. Dougherty, assistant to president, New York Central System; H. E. Newcomet, general manager, Western region, and C. I. Leiper, general manager, Central region, Pennsylvania System; and G. D. Brooke, general manager, Chesapeake & Ohio.

Numerous engineers were also elevated to the position of chief engineer during the year, including C. E. Weaver, Central of Georgia; T. J. Skillman, Long Island; F. B. Freeman, New York Central; Clark Dillenbeck, Reading; R. W. Barnes, Southern Pacific Lines; and F. C. Shepherd, chief construction engineer, and W. J. Backes, engineer maintenance of way, Boston & Maine.

A number of prominent engineers have also retired during the year, including C. K. Lawrence, chief engineer, Central of Georgia; and C. S. Churchill, vice-president and formerly engineer, Norfolk & Western; S. T. Wagner, chief engineer, Reading; George W. Kittridge, chief engineer, New York Central, and Robert Trimble, assistant chief engineer of the Pennsylvania.

Among the prominent engineers who have died during the year are William Hood, formerly chief engineer, Southern Pacific; W. H. Finley, president and formerly chief engineer, Chicago & North Western; G. A. Harwood, engineering vice-president, New York Central; S. B. Fisher, formerly chief engineer, Missouri-Kansas-Texas; Frank A. Merrill, chief engineer, Boston & Maine; A. O. Cunningham, formerly chief engineer, Wabash, and W. L. Rohbok, chief engineer, Wheeling & Lake Erie.

CANNOT AGREE.—Failure to agree on a joint line in Oregon has led the Southern Pacific and the Oregon Trunk to ask the Interstate Commerce Commission for the right to build independent lines in central Oregon.

Letters to the Editor

AS A ROADMASTER'S CLERK SEES IT

Somewhere Out West.

To the Editor:

I recently read the address by C. A. Morse before the Roadmaster's Association, appearing in *Railway Engineering and Maintenance* for October, relative to the handling of track forces, and the manner in which he cut right to the heart of the matter struck me so forcibly that I feel impelled to express my views.

My position for the past three years has been that of roadmaster's clerk on a large railroad. Officially, of course, my opinion counts for little, but practically it does amount to something, as I have been, so to speak, behind the scenes and have noted the practical working out of track policies.

The late E. H. Harriman was, I believe, the originator of the so-called "Rack of the Comparative Statement," the accumulated record of the achievements of the employee or officer, and I feel this should be practiced more with the track foreman. Is it not a fact that on many railroads the foreman is judged by the individual roadmaster, and that one roadmaster will judge him a good foreman and another say that he is not worth his salt? In each case it is only a personal opinion, and there are poor as well as good roadmasters.

We all know that a large proportion of the railroad's income is spent by track forces. We all know that a poor foreman can waste a lot of money; yet how many roads keep any kind of cost data on foremen's work? How many roadmasters can go into their offices and tell you from their records how much it costs to put in a crosstie on Section 5 as compared with Section 10? Can they tell you how much it costs to cut weeds, per foot of line, on their districts annually, so that a comparison can be made if the question of a weed killer should come up as a matter of economy? On a district where the sections are pretty much the same, is any record kept of the cost of some particular kind of work so the work of the various foremen can be compared?

Every month we get a labor distribution from the foreman. After it is corrected the original is sent to the division office, and the carbon is put in the files of the roadmaster's office. The distribution is recapped in the division office, and eventually finds its way into the fluctuation statement for the month. But how can the clerk in the division office know if the work is being done econmically? To the officer who gets the fluctuation statement it only represents the total for the division.

There is also the copy of the distribution that goes into the files in the roadmaster's office. After the clerk has heaved a heavy sigh about 10 p. m. on the third of the month and has filed the last of them away, are they ever looked at? Not so that you can notice. There are bushels of the most valuable information in the file, but unless the division office calls up about a report that is out of balance with the payroll, or asks for the meaning of some out-of-the-way charge, the distributions will remain on the shelf until they fall to pieces.

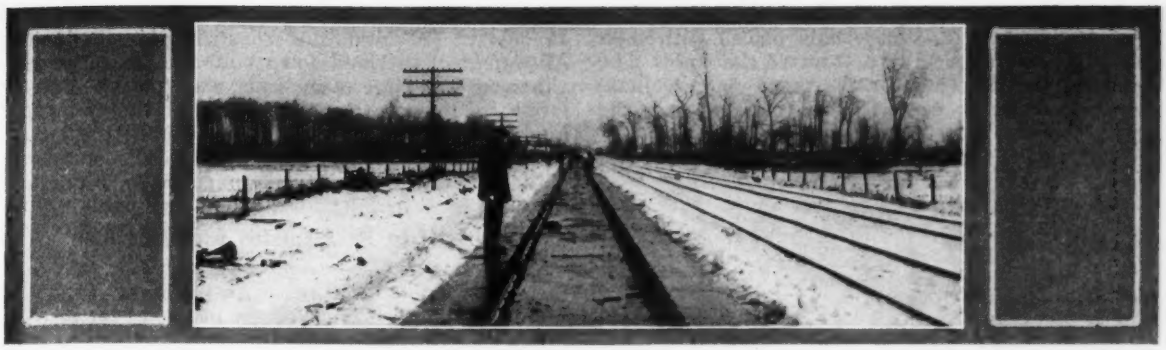
It seems to me that while the division office has to collect all the facts and figures for the various I. C. C. and other reports, the roadmaster's office should contain all of the information relative to the inside working of the district. The trouble is, however, that this does not seem to be recognized and no time is allowed to the clerk to develop such information. On one district I was able to work up a little information on my own time, such as record of stock killed on the district by mileages so that we were able later to show the locations where a right-of-way fence would pay, etc., but here I have 24 section foremen on the district, seven of them being on the local phone. It is not feasible to plan the day's work, as it is impossible to forecast what any day will bring forth, and it is all a clerk can do to keep up with current business and reports without working up any data for the roadmaster's use. By accumulating a file of really worth while comparative data we should be able to show the individual foreman wherein he is lagging, without leading him to think that the roadmaster has a "down" on him, as figures tell their tale in an absolutely impersonal way.

The idea of a graded wage scale seems so good that I cannot understand why it is not tried. I have suggested it several times to various officers, but that is as far as it goes. We should also have a regular apprentice system in track work to encourage American young men to enter track service, and all promotions, if possible, should be made from them. A section with a first class foreman could be picked out as the school, and the roadmaster could lecture to this class periodically on practical and theoretical aspects of the work, and the men could also be given instruction in making reports, etc. Also all foremen could assemble at times for a meeting with track officers. This would tend to keep them on their toes, encourage a competitive spirit and also foster a spirit of camaraderie among the foremen. Normally, foremen are more apart than milestones and seen together about as often. Letter writing has its place in the railroad world, but I can get more information to a foreman in 15 min. verbally or with a blackboard than I can by writing him 20 letters.

In this connection there is one matter I would like to mention, and that is the standing of a clerk to a roadmaster. At present on most roads the position pays just a little more than that of the office boy. The information that comes up through the track office is so vitally important that it seems to me it should be made an expert's job. A clerk who knows his business can catch and remedy many expensive errors, and also detect things that the ordinary clerk would pass over without noticing. A man in this position must first of all know his district geographically, know his foreman as personally as possible (some of them are as temperamental as any prima donna), know track materials and know a fair amount of I. C. C. accounting, including capital account charges. He must also have initiative and a real interest in his job, as he must handle urgent situations time and again when the roadmaster is on the line and out of immediate reach; above all that he must feel that it is his district as well as his roadmaster's. The compensation and status of the position, however, are such on most roads that the clerk bids out of it into a higher paid position in the superintendent's or engineer's office as soon as he gets the opportunity, with the result that there is a constant procession of clerks through the roadmaster's office, which demoralizes things generally and makes steady, consecutive performance in the office impossible.

Possibly I am prejudiced, but I think that this job should be a preferred one that is filled by appointment and not by bid, and paid well enough, possibly on a flat rate like most trainmaster's clerks, to make it worth while as a job to work *up to* and not so much *up from*.

WILLIAM S. HOFFORD.



Looking East Along the Completed Concrete Roadbed Construction

Will the Track of the Future Be Supported on Concrete?

Pere Marquette Begins Practical Test of Rigid Roadway Construction Near Detroit

ON DECEMBER 19 the Pere Marquette began to operate trains over a quarter mile of special track construction in which the rails are supported directly on a concrete slab. The object of this test is to determine the practicability of this form of construction. Specifically it is desired to ascertain whether or not the absence of any cushioning properties will result in excessive rail wear or in progressive destruction of the concrete. If it is found upon test that this special track is in reality a "permanent" construction, it is the opinion of Frank H. Alfred, president and general manager of the Pere Marquette, that it will open the way to definite economies in track maintenance.

The track construction under test comprises a marked departure from previous installations of the same general class, in that it provides no cushion between the rails and the concrete substructure. A thin sheet of bituminous felt which was placed under each rail was introduced solely to provide insulation and to compensate for minor irregularities in the bearing surfaces of the steel and the concrete.

The Test Was Carefully Planned

In arranging for a service test of this construction special pains have been taken to eliminate conditions which might introduce incidental contributing factors to unsatisfactory service. Thus, the site of the test is one offering exceedingly remote possibilities of subsidence or settlement. It is a flat country with a sandy soil through which the line was constructed on a grade that is raised only enough above the general level of the country to insure adequate drainage. The alinement is tangent and the grade is 0.1 per cent. The construction work also has been carried out in a way that insures concrete of a high strength and a good quality of workmanship in all respects.

The location is also one that will impose a thorough service test. The concrete roadbed is located at Beech, Mich., in the westbound track of the double-track main line of the Pere Marquette between Detroit, Mich., and Plymouth, and will carry all passenger and freight traffic from Detroit to Chicago and all points on the Pere Marquette lines in western and northern Michigan. The daily movement over this track includes seven scheduled passenger trains, seven scheduled freight trains, four regular switch movements and an average of two extra freight trains. The heaviest power employed is a Santa Fe type engine having a weight of 321,000 lb., of which 264,000 lb. is on the five driver axles. As a consequence, it is believed that the behavior of this construction in service should show conclusively whether or not the idea of rigid track construction is a thoroughly sound one.

Two other considerations also influenced the selection of the site for this test. The location is a convenient one for frequent observation by officers of the railroad. It is also sufficiently remote from crossings of important highways to give ample assurance against future changes of grade for grade crossing elimination.

The special track construction embraces a quarter mile of the westbound main track and the presence at Beech of a little used passing track on the south side of the eastbound main track simplified the development of a double track detour around the test track during the time that construction was in progress.

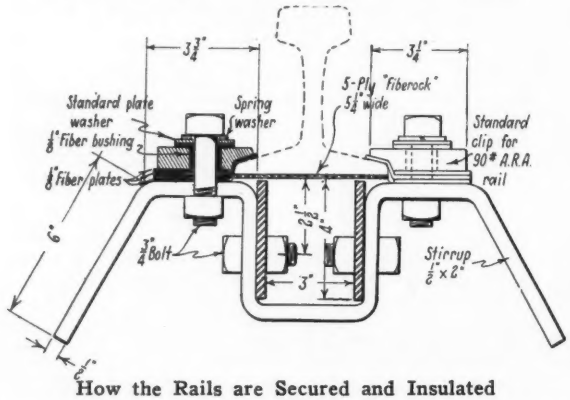
How the Track Slab Is Reinforced

The design of the test track conforms closely to that described in the article by Mr. Alfred and Paul Chipman (office engineer of the Pere Marquette) which appeared in the Railway Age of December 12, 1925, page 1083. As shown in the drawing, the rails are supported directly on a concrete slab 10 ft. wide and 21 in. thick, reinforced by a structural steel frame supplemented by plain bars. The frame consists of two longitudinal trusses placed vertically in the planes of the two rails and tied together at intervals of 6 ft. by ¾-in. adjustable tie rods in the plane of the top chords, with a steel bar cross frame at the location of each alternate tie rod.

While the two trusses form the primary longitu-

dinal reinforcement, they are supplemented by four ¾-in. and four ½-in. square bars placed with their centers 2½ in. above the bottom of the slab. The transverse reinforcement consists of ⅝-in. square bars 9 in. center to center, placed close to both the top and bottom faces of the slab.

While the top chord members of the trusses are

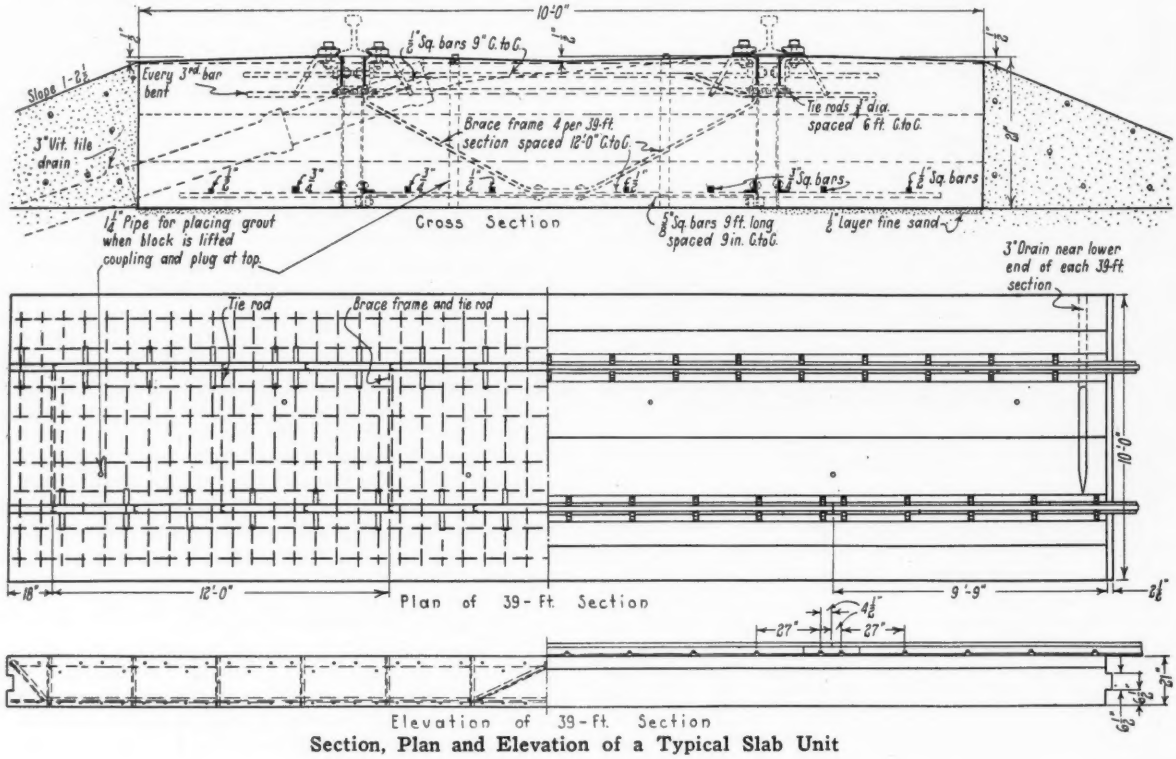


How the Rails are Secured and Insulated

entirely covered by concrete so that the rails have no direct contact with the reinforcement, the rails bear a fixed relation to the reinforcing trusses because the rail fastenings are rigidly connected to these trusses. At intervals of 27 in., the top chords of each truss are provided with stirrups made by bending a ½-in. by 2-in. bar to the shape of an inverted double U, the bases of these U's, one on each side of the truss chord, forming the seats for rail clips held in place by ¾-in. hold-down bolts which pass through holes in the stirrups into nuts on the under-side. In other words, tension on the hold-down bolts exerts an uplift directly on the main system of reinforcing. This arrangement also had an advantage from the construction standpoint. Alinement of the hold-down bolts and therefore the alinement and gage of the rails, was controlled absolutely by the alinement and gage of the two reinforcing trusses which were adjusted prior to placing the concrete, the exact gage being obtained by adjusting the tie rods previously mentioned, which are threaded for a length of 6½ in. on each end.

Rails Must Be Insulated From the Slab

While this rigid connection between the rails and the steel frame was of an advantage from the structural standpoint, it imposed the necessity for providing perfect insulation of the rails from the steel reinforcement. The rails are insulated from the steel reinforcement by a thin layer of concrete and a continuous strip of a 5-ply thickness of Carey's "fiberock" but it was also necessary to insure an effective separation of the rails from any metal of the hold-down system. This consists of the bolts previously mentioned and standard Carnegie rail clips for the 90-lb. A. R. A. Type A rails with which the track is laid. The insulation at each bolt consists of one bent fibre plate and two filler plates between the clip washer and the hold-down stirrup and a flanged bushing in the bolt hole in the rail clip. The flange of this bushing is protected from abrasion from a spring washer under the head of the bolt by means of a steel plate washer.



Section, Plan and Elevation of a Typical Slab Unit

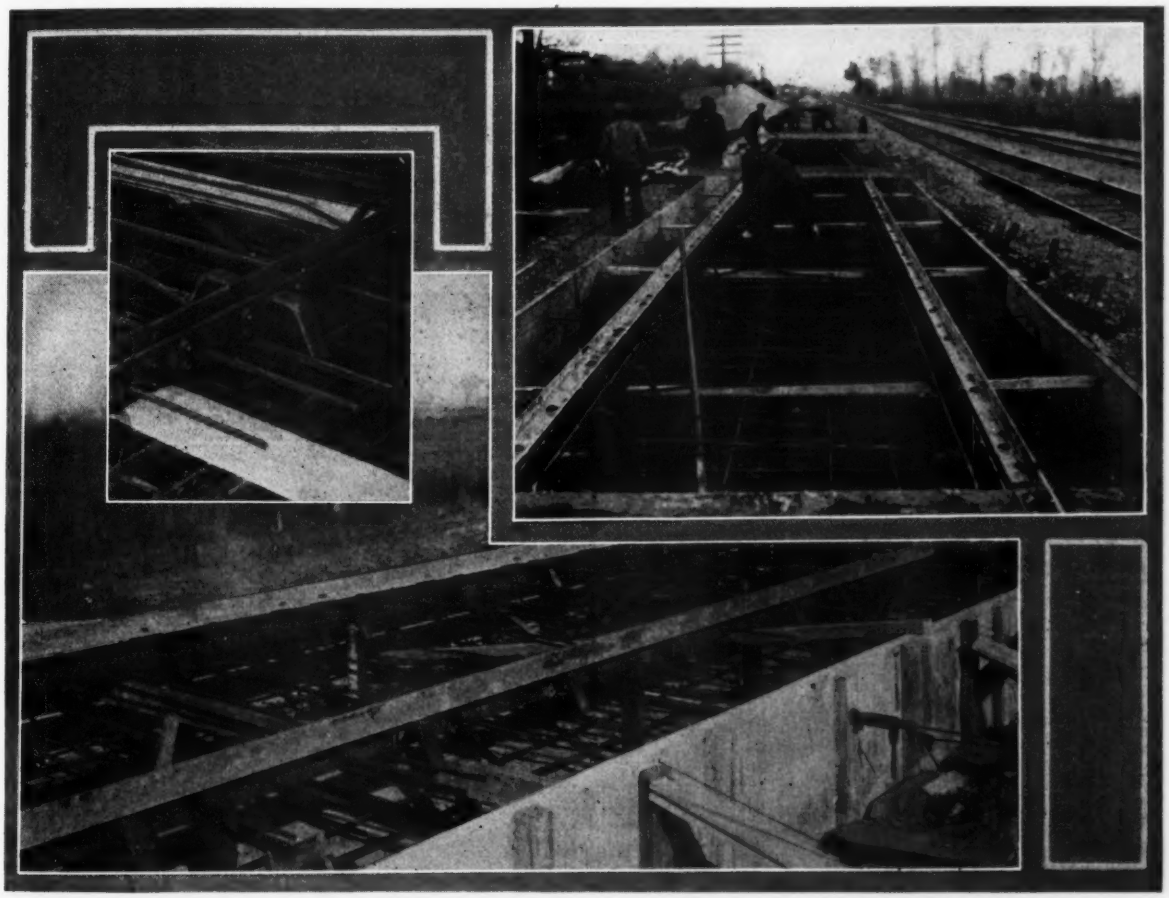
For purposes of construction and to provide contraction joints, the concrete slab was divided into units 39 ft. long, the same as the length of the rails which were laid with staggered joints so that the joints come at the quarter point of the slabs. Positive separation of the slabs at the joints is insured by providing 24-gage sheet metal separators, these separators being shaped to form a horizontal key

6½ in. wide by 2½ in. deep which prevents the offsetting of one slab relative to the other in the event of settlement. One side of each separation sheet was faced with Carey's Elastite filler.

For drainage, the top surface of the slab was made ½ in. lower along the two sides and along the center line of the track than it is at the rail bearings, water accumulating in the space between the rails being caught by a transverse gutter at the downgrade end of the slab which leads to a 3-in. vitrified tile cast in the slab which connects with a drain leading to the side ditch. Effective drainage between tracks was also insured by installing a line of tile bound trains were detoured through the passing track by means of the turnout switches at each end, while the westbound track at each end of the construction district was lined over to connect with the eastbound track.

The Slab Was Placed on the Old Ballast

To avoid additional expense and take advantage of the solidified condition of the roadbed, the ballast was removed only to the level of the bottom of the ties. This means that the track on the concrete roadbed is 15 in. higher than the parallel eastbound track and suitable run-offs were provided in the



How the Slab is Reinforced—In the Rectangle, One of the Hold-down Stirrups

at an adequate depth along the center line of the roadbed.

The installation of concrete roadbed construction described herewith is an experimental one and while its length, ¼ mile, is deemed sufficient to afford opportunity for a thorough service test, the volume of concrete involved is only 850 cu. yd. Consequently, the equipment provided for and the methods pursued in construction were those applicable to a small yardage of concrete and are in no way comparable to the plant or procedure which would be employed in the building of any considerable mileage of this type of construction.

The first step in the work was to release the site to the construction forces which, as previously mentioned, was readily possible in this case because of the presence of an adjacent passing track. Eastwestbound track at each end of the special construction.

It was proposed to roll the foundation for the concrete slabs prior to their construction but a trial proved that this was not practical on the gravel ballast. The rolling served to disturb rather than to compact this material. This experience, however, does not prove that rolling would not be highly desirable in cases where the concrete slab was placed on a roadbed of loam or clay soil. Because of the ineffectiveness of rolling, the top of the roadbed was brought to a uniform surface with a strike board and covered with a ¾-in. thickness of a stiff cement-sand mortar. This afforded a smooth and fairly impervious surface for the application of the concrete and by covering this mortar surface with a layer of sand, it provided a plane of separa-

tion between the slab and the roadbed which it is believed would be of advantage in case it should be found necessary to jack up the slabs to compensate for settlement.

Build Concrete Roadbed in 39-Ft. Units

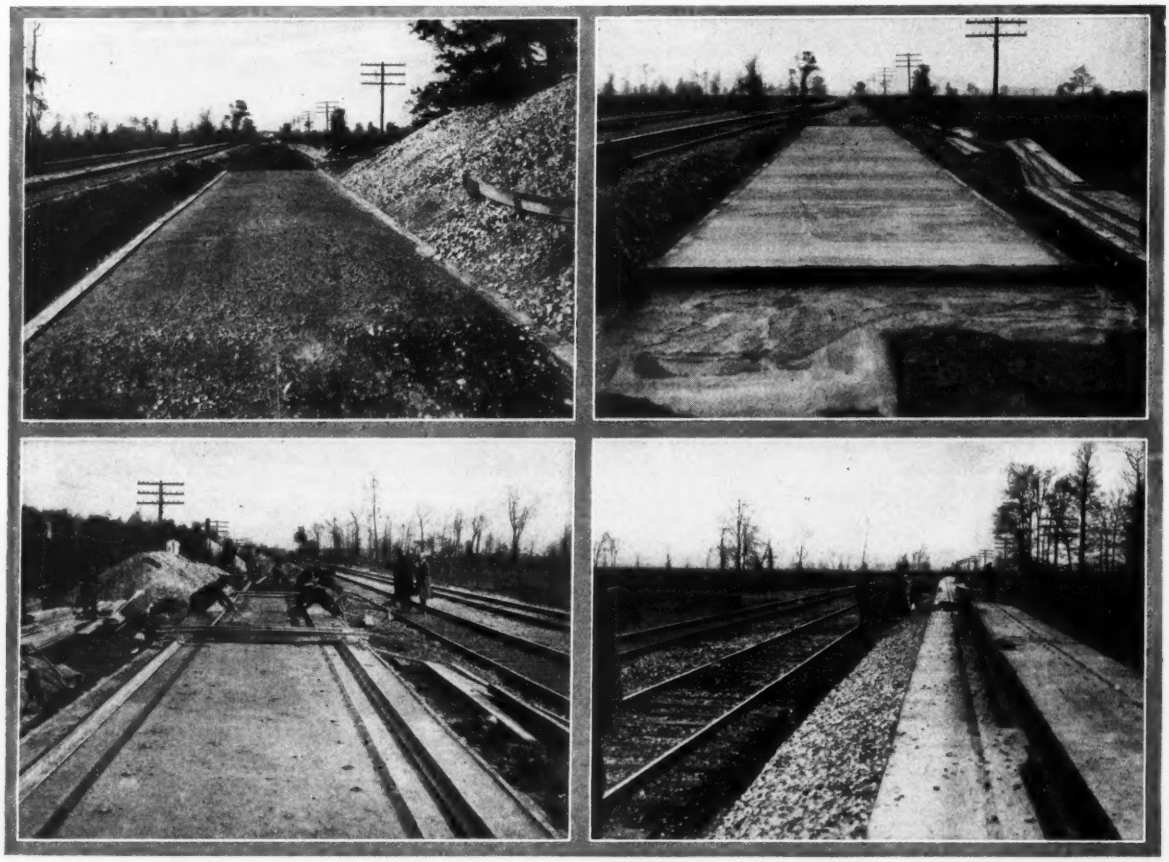
All of the work was carried out in units corresponding to the 39-ft. slab length and the preparation of the roadbed surface was followed in turn by placing the reinforcement. The two longitudinal trusses and cross frames were fabricated in a structural steel shop ready to be connected up in the field. After the reinforcement for a slab had been entirely assembled, a 3-in. by 3-in. angle iron was bolted to the hold-down stirrups over each truss by means of the clip bolts. These longitudinal angles were then carefully checked for alinement, gage and surface with the aid of a transit and a level to insure accurate position of the clip bolts and thereby secure correct alinement and surface of the rails.

Employ Simple Concrete Plant

Owing to the small yardage of concrete involved, only a relatively simple concrete plant was required. Concrete aggregates, sand and gravel pebbles, were unloaded in piles near each end of the track section and wheeled to the mixing plant which was first placed about midway of the length of the west half of the track section, and after this had been completed it was moved to a corresponding point for the east half. The concrete was delivered from the mixer to the forms in two-wheeled concrete buggies and with this arrangement the maximum haul was about 330 ft.

The concrete was proportioned according to the water-cement ratio to give a strength of about 4,000 lb. per sq. in. at 28 days. The consistency was such as to give a slump of from 3 to 4 in. No particular refinement was introduced in carrying out these requirements—deviations in the consistency due to variations in the grading of the aggregate being corrected by adjustments in the proportions of the fine or coarse aggregates. The top of the concrete was floated to a good working finish but the two rail bearings were carefully trowelled to an accurate surface, minor irregularities being removed by rubbing with carborundum bricks. The concrete was cured by keeping it covered with a blanket of moist sand about 1½ in. thick for at least seven days after placing the concrete. Every detail of the construction was under thorough supervision, and it is believed that the concrete is of good quality.

The test track was placed in service on December 19, or three weeks after the last concrete had been placed. Initial movements over it were at low speed under a slow order which is being modified from time to time to the end that all speed restrictions will be removed in a short time. The behavior of this track is being carefully watched through the agency of systematic inspections. The design was developed by Mr. Alfred with the assistance of Mr. Chipman who had direct charge of the construction.



First Step—The Leveled Roadbed
Finishing the Top of the Slab

Second Step—Grouting the Roadbed
Distributing the Rail on the Finished Slab

Moving An Old Stone Freight House 333 ft. Without Injury

The Chicago & Alton Station at Bloomington Was Transferred to a New Location After 37 Years' Service on Original Site

By W. T. BIGGS
Assistant Engineer, Chicago & Alton, Bloomington, Ill.

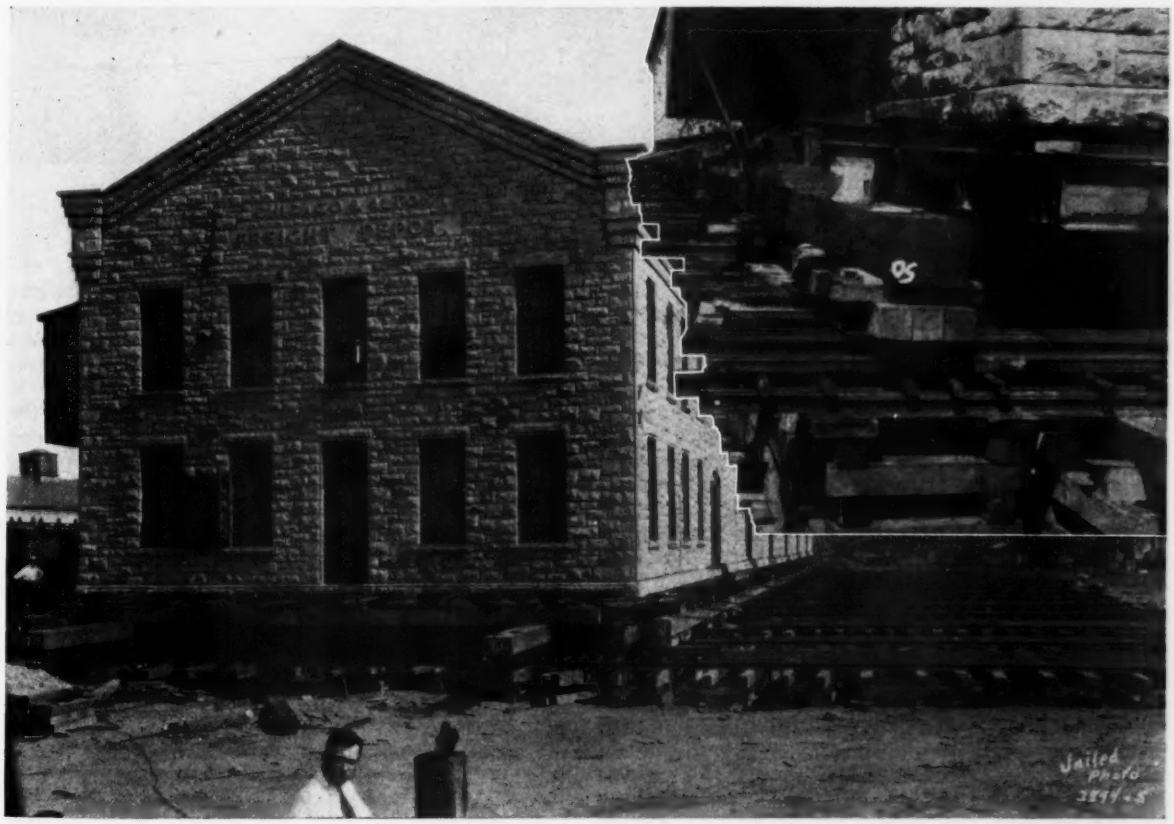
THE moving of an old stone freight house 225 ft. by 40 ft. in area and weighing 1,500 tons, for a distance of 333 ft., was an outstanding feature of a project for the enlargement of freight terminals of the Chicago & Alton at Bloomington, Ill. The change in the location of the building was made without cracking the walls or otherwise injuring the structure and without any interference or inconvenience with the office force, which continued to occupy the building during the entire operation.

This freight house is a substantial structure, built in 1888. It has ashlar Joliet limestone walls 18 in. thick. In the warehouse portion, which is 192 ft. long, the side walls, 22 ft. high, support iron roof trusses carrying a gable slate-covered roof. The office portion, which occupies a length of 33 ft. at the south end, is two stories in height, with walls 27 ft. high at the eaves and 37 ft. high at the ridge of the gable roof. A cross wall of full two-story height separates the warehouse from the office.

As shown on the small sketch, the old location of the freight house interfered with the enlargement of the freight yard, and as the building was in excellent condition, it was decided to move it to a new location fronting on Allin street, where it forms the principal unit of a local freight terminal which, including the house and team yard, occupies a triangular area fronting on Allin and Chestnut streets. This change in location entailed two operations; (1) the swinging of the building in the arc of a circle for a total angle of 26 deg., and (2) its movement lengthwise for 225 ft. It was also necessary to raise the building 3 ft. 4½ in. to meet the requirements of the new site, and it was found most convenient to carry out this operation at the old location before undertaking to move the house.

How the Building Was Under-Pinned

As a first step, trenches were dug on both sides of all of the walls for a width of 7 ft. and a depth of 3½ ft. The base of the walls consists of a water table resting on foundation walls 33 in. thick, and as



How the Building Was Supported on the Rolling Rig

this water table was built of heavy and rather long stones, it offered a substantial base on which to support the building or under-pinning. Accordingly, some 70 holes were cut through the foundation just under the water table to permit the under-pinning to be placed.

The side walls and the lower floor were supported on 25 12-in. by 12-in. timbers, 44 to 46 ft. long, placed crosswise of the building and projecting out of the foundation on each side. The end walls and the intermediate cross wall were supported on old rails used as needle beams spanning between groups of 12-in. I-beams, 40 ft. long, placed just under each side of each transverse wall. These I-beams, of which there were 18, as well as the 25 cross timbers, were supported in turn on four lines of carrying timbers placed longitudinally just outside and inside of the two longitudinal walls. These timbers were 3 ft. long, on which the building was moved. These rollers turned between the rails of the runways and rolling shoes placed under the carrying timbers in line with each runway. The shoes consisted of steel plates 18 in. wide and 48 in. long, backed by 2-in. planks which were chamfered on each end so that the plates could be bent up at the ends to facilitate the entry and release of the rollers as they passed under the shoes. The load was distributed to the shoes by means of three rails interspaced between the longitudinal carrying timbers and the shoes.

Two Horses Provide the Power

The power to move the building was supplied by two horses and two capstans with 3,000 ft. of ¾-in. wire rope. This cable was rove alternately through 12 pulleys attached to the side of the building at uniform intervals and 15 pulleys secured to pins

Arrangement of the Hauling Gear for the Sidewise Movement

12-in. by 18-in. Douglas fir sticks from 50 to 80 ft. long.

After this under-pinning was completed, the building was raised to the new elevation, an operation which required 600 screw jacks, 1,200 maple collar blocks and 3,500 pine blocks 6 in. by 6 in. by 3 ft. The jacks were placed under the carrying timbers and were supported on the blocking which was cribbed up as the building was raised, it being necessary to reset the jacks four times to complete the full raise.

One-quarter of a turn was applied to each jack at a time as the workmen moved around the building from one jack to another. One complete turn of the jacks raised the building 1/7 in., so that 28 quarter turns were required to raise it an inch. Each jack was given 1,176 quarter turns for the full raise, or a total of 705,600 quarter turns were required to raise the building.

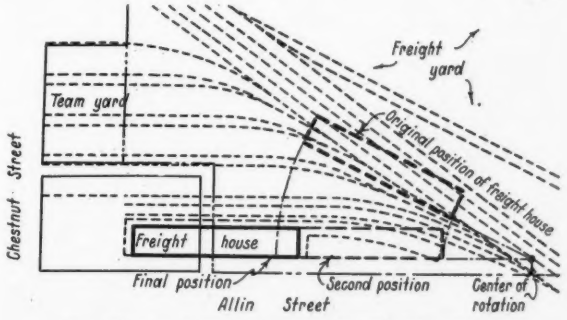
To move the building sideways 18 runways were built, each consisting of five lines of rails spaced as closely together as possible and still allow room for lapping the joints of the several lengths of rails required. Great care was taken to insure that the runways were leveled accurately to avoid distortion of the building and reduce the friction of rolling on the chrome steel rollers, 2½ in. in diameter and driven in the ground beyond the ends of the runways, thus producing a zig-zag arrangement of the cable, each end of which was carried out to a capstan and after about five turns, was carried still further to a drum on which the cable was wound as it was hauled in by the capstan. This arrangement is shown in one of the photographs.

One horse was employed on each capstan, the horse at the south end of the building or the end that moved the greatest distance sidewise, supplying most of the power. The other horse traveled slowly and was used merely to hold the tension and maintain a uniform pull. After a stop in the rolling the slow horse assisted in taking up the slack and aided in applying the power to the whole building simultaneously whenever a fresh start was taken. As a matter of fact, it was found possible to move the building by the use of one horse alone.

For the lengthwise movement, all of the shoes, rollers and runways had to be rearranged, but only five rail runways were required. The same cable and the same number of pulleys were used, but it was only necessary to use one horse. During the sidewise movement considerable time and care were taken to keep the rollers in line with the flag, but the movement lengthwise was much easier to handle, due to

the fact that the rollers were kept in line easily.

The new site for the building was prepared by constructing a foundation with the tops of the walls level with the ground surface, in advance of the moving operation. In this condition the foundation was low enough to permit the steel runways to pass over it. After the building was in position and the runways had been removed, the foundation walls were completed. By providing forms that extended somewhat above the level of the bottom of the water table it was possible to spade stiff concrete thoroughly under the water table and thus insure adequate support before removing the under-pinning.



The New and Old Sites of the Freight House

One circumstance which favored the moving operation was the fact that all of the sidewise movement was carried out over an area which had served as a driveway or approach to the old freight station and was paved with about two feet of macadam which afforded a firm foundation for the moving operation. However, the new site of the building offered nothing but black earth on which it was necessary to distribute the moving load with a heavy grillage of rails and ties. It would have been possible to carry out the movement in a direct line from the old site to the new one, but the movement in two stages as carried out was considered preferable because it permitted greater advantage to be taken of the macadam foundation.

While the clerical forces occupied the building during the entire moving operation, the warehouse was out of service for 75 days. It was possible, however, to use the freighthouse for 15 days prior to raising it, while the under-pinning was being placed. Of the total time of 75 days, 40 days were required to raise the building and install the runways and 8 days were consumed in rolling, that is, 4 days for the sidewise movement and 4 days for the longitudinal movement. The work was seriously hampered by unfavorable weather, for there were 40 rainy days, during which there was a total precipitation of 24¼ in.

The contract for moving this building was let to E. M. LaPlant of Cedar Rapids, Iowa, who personally superintended the work, with the assistance of R. C. Cole. engineer. The same contractor placed the foundation for the building. The work was carried out under the general direction of R. A. Cook, chief engineer of the Chicago & Alton, and under the immediate supervision of the writer.

Method of Stacking Ties Influences Rate of Seasoning

By FRED F. FRANKLIN
Treating Inspector

PRACTICALLY all crossties in storage and seasoning yards throughout the country are piled by the standard one-by-nine method of stacking. However, the stacking is not done exactly the same in all cases, one source of deviation being the method of starting the stack on the sills. Those who have given any thought to stacking have no doubt wondered if such differences in the methods were of any consequence. In an effort to answer this question a series of tests was carried out on ties selected from stacks built according to two different methods. A year was required to run the tests in order to carry them through at various seasons and obtain average results and also because the writer did not at all times have access to the material covering the two methods as described herein.

The pictures show two of the stacking methods most commonly used. Perhaps the difference in the two stacks as shown appears at first to be insignificant, but for the purpose of seasoning and the subsequent preservative penetration, there is a difference that is undoubtedly worthy of consideration. The first view shows the first layer of ties in the stack resting directly on the creosoted sill ties. This is a very common method and for convenience it will be referred to as Method 1. The second view shows that the first full layer of ties has been elevated by a height equal to the thickness of two ties. The first layer, in other words, has been cribbed up from 12 to 18 in., depending upon the grade of ties. This method is designated as Method 2. With the latter method there is slightly more chance of stack burning than in the first method, but the advantages or results obtained in the cribbed up method offset the possible damage by stack burning. In fact, the writer has found very few stack burned ties in stacks piled according to Method 2.

It is almost obvious that better air circulation is obtained in the lower part of Method 2 stacks and accordingly the ties will dry in a shorter period. The opposite result can be expected of Method 1 and is especially true where the sill ties are likely to sink two or three inches, leaving the first layer practically on the ground, and this may happen in almost any yard. Actual moisture tests run on ties 12 to 15 months old found in stacks of both types, reveal a great difference in the rate of seasoning. Inasmuch as the primary purposes of stacking green ties carefully are to reduce the moisture percent and thus make them more receptive for various preservatives, to reduce their weight and to make them less susceptible to fungous growths, we are interested in the method that most nearly gives the desired results.

To determine if there was any positive difference

in the moisture content or penetration of preservative in ties that had been piled according to the two methods of stacking, a series of tests was carried out for the purpose of ascertaining the actual moisture content and the penetration of preservative in a number of ties taken from stacks of the two types.

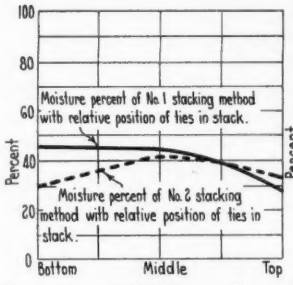
A Common Method of Stacking—Method 1

The tests were made on specimens taken with a standard size increment borer at the rail bearing of main-line, red oak ties. The moisture tests were made from both sawn and hewn ties found in the bottom, middle and top layers of the stacks. No tests were made from ties found in either the front or back cribs of the stacks. The complete tests were carried out at a tie storage yard and treating plant in Indiana which should be fairly representative of the TA crosstie belt. In this particular yard the stacks contain five cribs, so the tests were made on ties from the second, third or fourth cribs. The moisture specimens were placed in bottles for transportation to an electric oven, where they were uncorked and placed in the oven and dried to a constant weight.

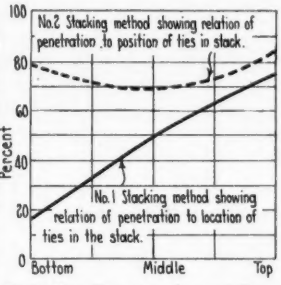
The Cribbed Up Stack; Method 2

Similar methods were pursued in taking the specimens for depth of penetration on ties subjected to a treatment with 6 lb. per cu. ft. of creosote-tar mixture (80 per cent distillate A.R.E.A. No. 1 and 20 per cent coal tar) by the Rueping process The borings were all of a uniform depth of four inches and each boring was measured for total length as well as for depth of penetration. The per cent of penetration as shown on the graph is not the per cent of wood in the tie that is actually treated, but the relation of the depth of penetration to the four-inch length of the boring.

As shown in the graph of moisture per cent curves, the difference in moisture content of ties found in the two methods of stacking is not so striking. The relation, however, is very noticeable when it is revealed that the majority of moisture per cent tests of ties stacked according to Method 2 were taken during the past fall while the majority of tests of Method 1 ties were taken during the spring and summer months. It will be remembered that the past fall was an exceedingly wet one, and that perhaps accounts for the fact that stacking Method 2 showed a higher per cent of moisture content in the top of the stack than Method 1. Normally ties in the top layers of the stack should have the same per cent of moisture. It is the ties in the bottom and middle of the two types of stacks that should vary—and there is reason to believe that they will show even a greater difference when the tests are made under more nearly similar weather conditions. Even if the percentage of moisture content in these tests had been the same for the top layers of the stacks (both methods) the graphs would then show more clearly the difference in the results obtained by the different methods of stacking.



Per cent of Moisture Content of Ties Stacked According to the Two Methods



Relative Penetration of Preservatives in Ties Stacked by the Two Methods

The penetration per cent curve for stacking Method 2 does not run exactly to form when compared with the moisture per cent curve of stacking Method 2. In other words, one would expect the penetration of preservative in ties from the tops of the stacks piled according to Method 2 to be lower than the penetration in ties from the tops of stacks piled according to Method 1 when the moisture per cent is reversed. This can perhaps be explained by the fact that the penetration per cent curve for Method 2 was determined after the rainy season in the past fall. Considering the varying conditions with which all the tests were made, the results have conformed even closer than was expected.

In conclusion, it may be said that the tests tend to show that the cribbed up stack or stacking Method 2 is better in securing:

(1) Quicker and more thorough seasoning.

(2) A 15 to 20 per cent deeper penetration of preservative.

(3) A more uniform penetration in ties from various parts of the stack.

On the Champlain Division Where Rail Is Laid in Winter

Winter Work Solves Labor Problems on the Delaware & Hudson

Experience on This Road Clearly Demonstrates the Practicability and the Advantages of a 12-Month Maintenance Program

ONE of the outstanding policies of the maintenance of way department of the Delaware & Hudson, which has been proved sound by that road after several years of successful experimentation and actual accomplishments, is that of programing maintenance work over the 12 months of the year as a step toward the establishment of uniform trained forces and the full utilization of those forces throughout the winter when not actually engaged in fighting snow storms.

Until recent years maintenance of way work on the Delaware & Hudson was done on a strictly seasonal basis; the entire program was crowded into the spring, summer and fall months; forces were built up during the working seasons and reduced during the winter, except in emergencies; and the inevitable result was: over-crowded programs during the summer, maximum interference with traffic during the work, heavy labor turnover with the continual influx of inexperienced labor, and, of no less importance, the accomplishment of inferior work by this class of labor and the general lowering of the morale of the regular forces which could not expect steady employment or the most satisfactory working conditions under these circumstances.

Adding to the disadvantages of this practice as carried out on the D. & H., was the fact that in spite of the lack of winter work it was always necessary to keep a large number of men on the payroll to meet snow emergencies, serious difficulty having been experienced in many instances in obtaining additional forces when and where needed on short notice. Without a definite program of winter work, these forces accomplished little other than the handling of snow during severe weather, remaining practically idle the remainder of the time as far as constructive work was concerned.

Problem of Productive Work in Winter

The solution of the D. & H.'s problem lay, apparently, in a redistribution of its maintenance program to provide for winter work, and uniform forces throughout the year. Recognizing this, and in spite of the favorable and unfavorable experiences of other roads and the severe winter conditions existing throughout its territory, the D. & H. began experimenting with certain classes of maintenance work during the winter. These experiments showed conclusively that in spite of the cold weather and severe storms often encountered on their lines, open periods occurred frequently enough and long enough in duration to permit the effective accomplishment of considerable constructive work. As a result of these experiments a larger amount of work has been planned and carried out during the past few years, until the former practice of strictly seasonal employment, with its disadvantages, has given way to a conservative yet highly effective policy of maintaining as uniform forces as possible through the handling of various classes of work during the otherwise slack winter months.

As on many other roads which undertake mainte-

nance work during the winter, the main operations carried out by the track forces of the D. & H. include the laying of new and relay rail, the installing of tie plates and anti-creepers, the renewing of switches and frogs, and the regaging of track, no attempt being made to carry on any kind of work which involves disturbing the ballast or roadbed. Other work that months of 1920, 1925 and 1926. As indicated in this chart, practically no major work was accomplished by the large forces employed during the winter of 1920, except the installation of about 26,000 ties and the laying of 1,200 tons of relay rail in April, the forces being carried throughout the other winter months mainly to cope with winter storms which

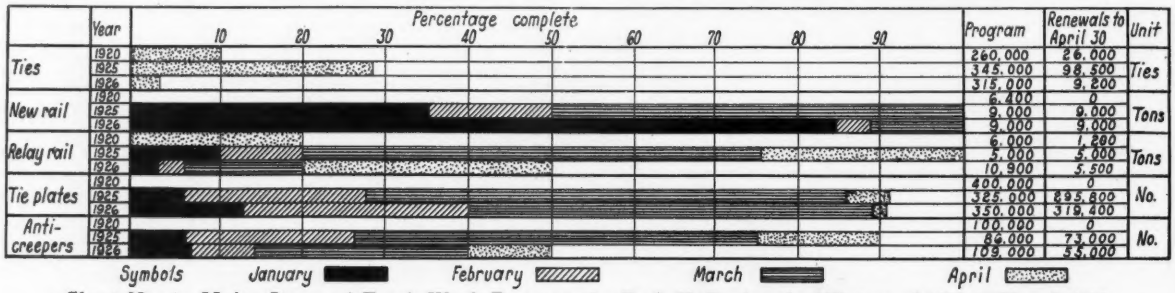


Chart No. 1—Major Items of Track Work Done on the D. & H. During the Winters of 1920, 1925 and 1926

it has been found practical to perform to a greater or less extent includes the repair of fences, other than digging in posts when the ground is frozen, the widening of embankments with cinders in connection with realinement work, the improving of drainage conditions, the burning and cleaning of the right-of-way in March and April, and such other work of minor importance as can be accomplished readily in the winter, and which if not done at this season, must be carried over and included in the crowded maintenance program of the summer months. While all of these classes of work have been undertaken successfully throughout the past few winters, the were particularly severe in March of that year. In 1925 and 1926, on the other hand, with fewer man hours employed, as indicated in chart No. 3, but with more favorable weather conditions, the entire new rail programs were completed by the end of March of each year, in addition to considerable other important work. This other work accomplished in the first four months of 1925 consisted mainly of completing the year's program of laying 5,000 tons of relay rail, and the installing of 295,800 tie plates and 73,000 anti-creepers, while that completed in the same months of 1926 consisted of the laying of 5,500 tons of relay rail and the installing of 319,400 tie plates

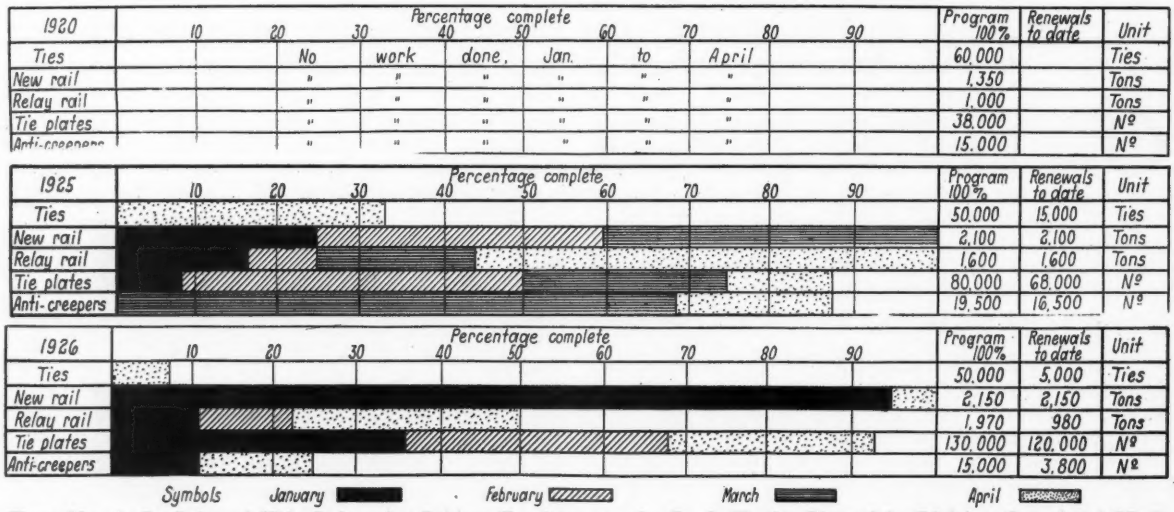


Chart No. 2—In Spite of This Being the Coldest Territory on the D. & H. the Champlain Division Completed Much Winter Work

amount of each class completed has been governed to a large extent by the character of the weather and the amount of time that the forces had to be employed in fighting snow to keep the tracks open. As programmed on the D. & H., however, one kind of work or another is at hand at all times to keep the forces effectively employed, and all the men clearly understand that results are expected.

That actual results have been accomplished during the past two winters is clearly evidenced in chart No. 1, which shows the character and amount of the more important work completed during the first four and 55,000 anti-creepers, these amounts in each case representing a considerable percentage of the entire program for each year. The fluctuations noted with respect to the total amount of each class of work completed and the amount accomplished in each month are to a large extent due to the character of the weather which was encountered.

Similar to the chart already noted, is chart No. 2, which shows the amount of the more important track work accomplished on the Champlain division of the D. & H. during the winter months of the same years represented in chart No. 1. The results shown in

this chart are of particular interest owing to the fact that this division is the coldest on the railroad, the temperature often dropping to as low as 30 to 40 deg. below zero, and the one which generally experiences the most severe snow storms. In spite of this it will be seen that, closely following the trend of the system work as a whole, all of its new rail was laid during the winters of 1925 and 1926 and that in addition, a large percentage of its other regular track work was carried out successfully.

Programing and Advance Preparations Necessary to Winter Work

In accomplishing these results on the D. & H., the first problem encountered was to overcome the precedent of former years and to make it clear to everyone concerned that the new policy contemplated the accomplishment of constructive work for every man hour employed. Accordingly, programs were mapped out for each division and plans were made to meet them. The largest item of maintenance work undertaken during the winter, as has been noted, is the laying of new and relay rail on the main and branch line tracks, which, in spite of winter conditions, is carried out in much the same manner as in summer. In general this work is pushed through in January as far as possible, for two reasons: (1) because the present distribution of maintenance of way accounts will not permit rail laying in advance of January 1, and (2) because January is a comparatively open month in the territory of the D. & H., as compared with February, when the most severe storms generally occur.

In preparing for winter rail laying operations, the tracks to be relaid are raised slightly and surfaced early in the fall in order to facilitate rail laying conditions if snow should be on the ground, and the ballast is dug out around the anti-creepers so as to preclude the digging of frozen ballast in removing and applying anti-creepers when the rail is laid. With this work done, the new track material is distributed during the latter part of November and on through December as received, the rail being set up on the shoulder of the roadbed and the tie plates being placed between the ends of the ties, while the rail joint bars, bolts, spikes and anti-creepers are grouped together along the track at frequent intervals to prevent their being covered over by snow and lost.

Rail Laying Encounters Few Difficulties

The actual rail laying operations are effected by the regular section and extra gang forces which are bunched into gangs ranging from about 25 to 100 men, the rail being taken out and set in place by tongs or cranes as the case may be. If any considerable amount of snow is on the track, snow plows, snow sweepers and flangers are used to remove it in advance of the rail laying, and several men with brooms sweep off the ties near the rail where this is necessary. Following this, the rail joint bars, bolts and spikes are distributed and rail laying begins. In most cases on double track, this is facilitated by obtaining the unrestricted use of the track to be relaid, a condition which is made possible on the D. & H. in the winter with little interference to traffic owing to the lighter freight movement and the greatly reduced number of passenger trains at this season of the year.

When renewing the rail, tie plates and anti-creepers are installed where necessary, the work continuing to completion unless interrupted by a snow storm. The only difficulties of importance which have been encountered in carrying out this work have been the snow, extremely cold weather, and in some instances, the existence of ice about the rail; serious conditions of this nature, however, have been the exception rather than the rule and the work has always proceeded in an orderly manner with few interruptions.

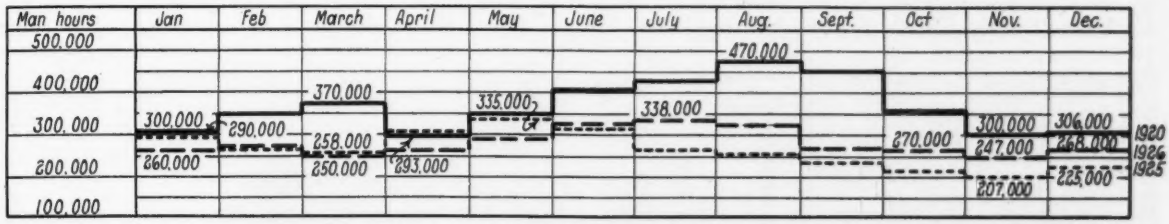


Chart No. 3—The System Man-Hour Curves for 1920, 1925 and 1926 Show the Decided Tendency Toward Uniform Forces

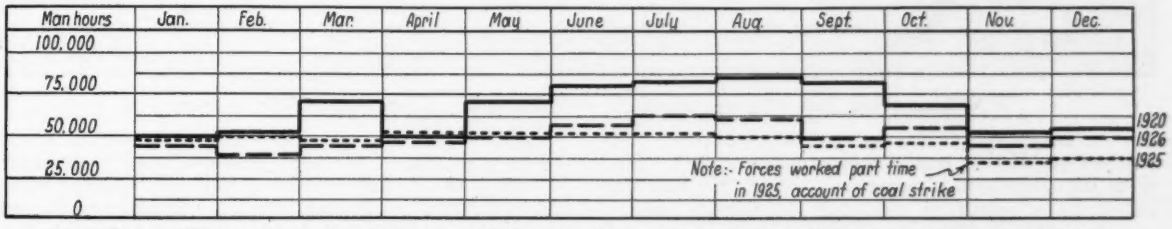


Chart No. 4—Winter Work Has Greatly Stabilized the Man Hours Employed on the Champlain Division

Increased Cost Is Offset by Advantages

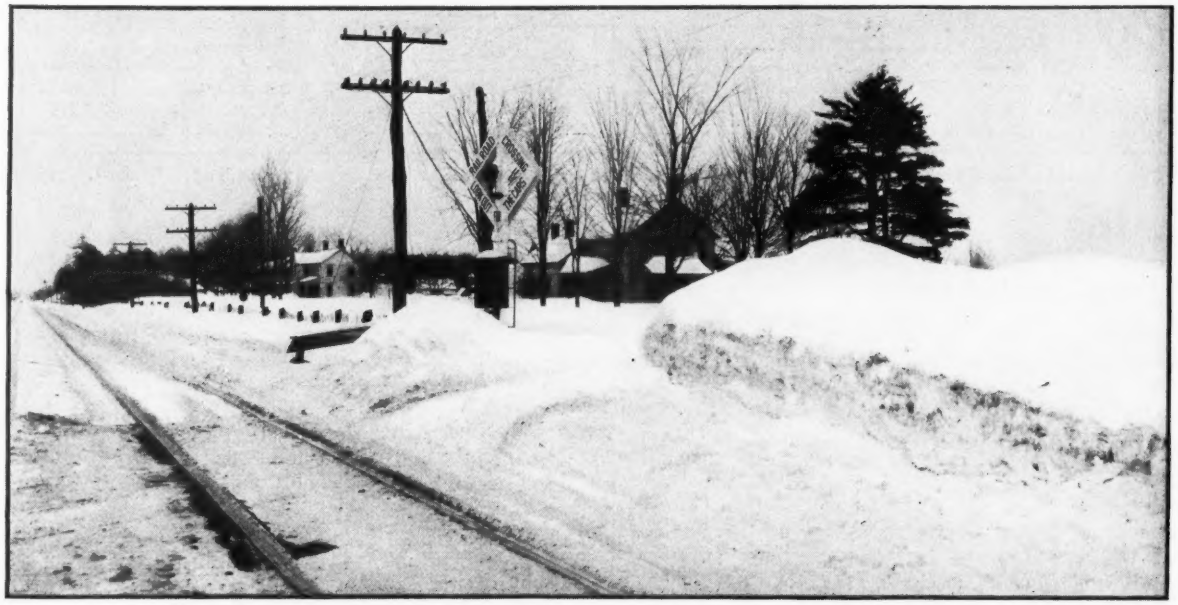
In accomplishing this work it is not the contention of the D. & H. that the actual work can be done more economically in winter, nor as economical, in some instances, as it might be done at other seasons of the year. On the other hand, actual experience has clearly demonstrated that certain results are obtained from carrying on winter maintenance work which far more than offset any slight increase in the cost of the work. Among these, and one of the more important, is that by doing the work in the

winter the D. & H. has found profitable employment for the relatively large forces which it is forced to maintain to meet snow emergencies. In addition, it has been found that work at this season causes the least interference to traffic and is the least interfered with by traffic. Furthermore, a good quality of work is obtained, and by getting this work out of the way and thus reducing the work necessary during the remaining part of the year, it is possible to carry on the summer work in a more orderly manner by the regular experienced forces, and with closer supervision, which results in increased output per man hour and a higher standard of maintenance.

Winter Work Stabilizes Maintenance Forces

While all of the above results have been effected by the winter work policy of the D. & H., the principal result sought and accomplished has been the marked stabilizing of the maintenance of way forces, with its attendant advantages. That this has come about as a result of carrying on winter work is clearly indicated in chart No. 3, where the man hours employed during 1920, before winter work was the policy, are compared with the man hours that were employed during 1925 and 1926. By referring to this chart it will be noted that in 1920 the man hours employed fluctuated widely, ranging from 300,000 in January to 370,000 in March, then declining to 293,000 in April. Increasing gradually from April, with a heavy summer program on hand, the number of man hours employed again increased and finally reached a peak of 470,000 in August, only to slump off to 300,000 again in November. On the other hand, the same chart shows that in 1925 the man hours employed during the winter months decreased from 290,000 in January to 258,000 in March, and then increased to a peak of only 335,000 man hours in May, from which time it declined to 207,000 man hours in November, the lowest number of man hours employed during any month in that year. During 1926, the results accomplished in attempting to maintain uniform forces are even more striking, as compared with 1920. During the winter months of this year the actual man hours employed remained within a few thousand of 260,000, while the summer program required the peak employment of only 338,000 in July. Summarizing these figures, it is noted that while there was a maximum fluctuation of 177,000 man hours in 1920, between the winter and summer months, this figure was cut to 128,000 in 1925 and to 88,000 in 1926.

While these figures indicate a decided straightening out of the man hour curve in the maintenance department of the D. & H., it is important to note that the figures quoted and the curves in chart No. 3 do not give the true relation of the number of men employed throughout the year and that a curve indicating the number of men employed would assume an even more uniform horizontal line. This is due to the fact that the D. & H. increases the working day of a part of the maintenance force from eight to ten hours during several months of the year when most feasible or when the work is most pressing, such increases showing up in a man hour curve when they would not alter a force curve. Thus, for example, the high spots in man hours in April, May and June of 1925 were due to working a part of the track forces for a ten-hour day in order to take advantage of an early spring for making tie renewals, and were not due to any appreciable increase in force. The dropping of the curve during July and August of 1925 is the result of working practically the same forces for an eight-hour day, and the further drop of the curve through the remainder of the year was due to the fact that it was necessary to work on a part time basis during the coal strike which was in effect at that time. In 1926, owing to a late spring, it was not possible to get much of a start on tie renewals, so that the increase in man hours due to working the regular forces on a ten-hour basis did not occur until the latter part of June, July and a part of August. Other conditions which enter into the fluctuation of man hours are, of course, the employment of the regular forces on capital expenditure projects



Winter Work Has Proved Successful in Spite of Occasional Heavy Falls of Snow

and on work for outside parties. In practically all of these instances it is apparent, therefore, that while there still exists a considerable difference in the number of man hours employed during the winter and summer on the D. & H., this is not due to a large increase in the maintenance forces, but rather, in large measure, to carrying on other than strictly maintenance work, and the policy of working the regular forces an increased number of hours during certain seasons.

These same reasons apply to chart No. 4, which, in spite of them, shows the unusual uniformity in the number of man hours employed on the Champlain division during 1925 and 1926, as compared with the widely fluctuating man hours employed on this same division in 1920.

This stabilizing of the maintenance forces on the D. & H. has, of course, been due largely to its policy of completing certain track work during the winter, and while specific attention has been drawn to the work accomplished by the track forces, it is important to note that the winter work policy of the D. & H. extends to all maintenance forces, and that in some respects it is more successfully carried out in the bridge, building and water service departments than it has been possible to carry it out in the track department.

The Delaware & Hudson is definitely convinced of the advantages of holding its experienced forces, and while winter work accomplishes this to a large extent, it is only one of the expedients employed to make maintenance work attractive to the better class of men who seek steady employment and favorable working conditions. Other inducements offered the maintenance forces of the D. & H. include a systematic program of training and promotion, with an equal opportunity for each man; a differential in the pay of the track forces, ranging throughout a period of from six months to five years; death and disability insurance according to their salaries, regular two-week vacations for foremen, and track awards for proficiency in carrying out their work.

Having followed out these practices on the D. & H. for the past few years, labor troubles have disappeared; labor turnover is a thing of the past; and of large importance, more and better work is being accomplished in fewer man hours and with a marked decrease in the number of personal injuries.

With the management of the Delaware & Hudson, credit for the maintenance policies on that road, together with the unusual results being obtained, is due to H. S. Clarke, engineer maintenance of way, to whom we are indebted for the information contained in this article.

Railroads Report Results of Annual Track Inspections

SUPPLEMENTING the results of the annual track inspection of the Eastern region of the Pennsylvania, reported in last month's issue, we present below brief summaries of the results of track inspections and the award of prizes on 11 other railroads as carried out in the closing months of 1926.

Supervisors and Foremen Rewarded on Pere Marquette

William Meier, track supervisor on the Detroit division of the Pere Marquette, received the highest grade and his sub-division also showed the greatest improvement over the previous year, as a result of annual track inspections for 1926. He, therefore, received a prize of $100 for the highest rating, while the improvement prize, which also amounts to $100, was awarded to F. D. Harrigan, supervisor on the Toledo division, whose subdivision (extending from Bay City, Mich., to Holly) was second in rank in both rating and improvement. In addition to the above, prizes of $25 were awarded to the foremen whose sections received the highest rating on each subdivision as well as to the foremen whose sections showed the greatest improvement on each subdivision.

Lehigh Valley Results

On the Lehigh Valley the New York division, A. M. King, division engineer, and the Wyoming division, F. N. Loughman, division engineer, carried the highest standing, each having received a rating of 99.38 per cent. The next highest standing was given the Seneca division, E. J. Cullen, division engineer, which received a rating of 99.33 per cent, while the third highest rating, 99.08 per cent, was given to the New Jersey and Lehigh division, J. F. Donovan, division engineer. The results by subdivisions gave H. F. Reilly, supervisor on the Wyoming division, the highest rating, or 99.67 per cent; J. A. Murphy, supervisor on the Seneca division, second with 99.62 per cent; and P. J. McNulty, another supervisor on the Seneca division, third with 99.43 per cent. These ratings represent the sums of individual ratings determined independently for various items of track maintenance, the maximum percentages allotted to each classification being as follows: Surface, 35 per cent; line, 35 per cent; ties, joints and anti-creepers, ballast, drainage, and general appearance, each 6 per cent.

D. & H. Awards 32 Cash Prizes

Following the practice of the past few years, the Delaware & Hudson again awarded 32 cash prizes, aggregating a total sum of $2,000 to teach foremen, the winners having been selected after the annual track inspection in October. In order to create a wide-spread interest among the men, the prizes were awarded according to the three principal classes of sections, namely, main line, branch line and yard. In addition, special prizes were awarded to those sections showing the greatest physical improvement during the year.

In all the awards included 4 system prizes, 2 main line and 2 branch line; 16 division prizes, 8 main line and 8 branch line; 4 yard prizes, and 8 prizes for the sections showing the greatest improvement. The grand system main line prize for 1926 was won by L. Delasco, foreman of section No. 9 of the Susquehanna division whose track was given a rating of 97.2, while the second system main line prize was won by C. Woodbury, foreman of section No. 7 of

the Saratoga division, whose track received a rating of 94.0. The first and second system prizes for the best branch line sections were won respectively by F. Alphonse, foreman of section No. 12 of the Champlain division, with a track rating of 84.2, and foreman A. Ross, of section No. 6 of the Saratoga division, with a track rating of 82.6. The first and second system prizes amount to $50 and $25 respectively, which is awarded to the winning foremen in addition to the first and second division prizes which amount to $100 and $50 respectively. The two yard section prizes are also $100 for the first prize and $50 for the second, while those for the sections showing the greatest improvement are $50 and $25.

Southern Again Awards Motor Cars and Cash

As a result of the Southern's annual inspection, 159 foremen in the track and bridge and building departments were awarded prizes, the Northern district receiving the highest rating, 79.1 as compared with 78.9 for the Middle district and 78.3 for the Eastern district. By divisions, the highest rating for roadway maintenance was awarded to the Danville division (main line), Northern district, 80.9 points, and the second highest to the Coster division, Middle district, with 80.7 points. The highest ratings for bridge and building maintenance were awarded to the Danville division (main line), Northern district, the Charlotte N. E. and Charlotte S. E. divisions, and the Coster division, Middle district, all of which received the rating of 81.5 points.

In arriving at the grades given roadway, maintenance, cross ties and switch ties were rated 2-25 points, line and surface 0-25 points, ditching and roadbed, rail joints and turnouts 0-20 points, standards 0-20 points, and station grounds and right-of-way 0-10 points. Grading of the work of the bridge and building forces was similarly classified.

As in previous years, motor cars were awarded for first prizes, $20 gold pieces for second prizes and $10 gold pieces for third prizes. If the first prize winner already had a motor car he received $20 in gold and the car went to the second prize winner, unless he too had a car in which case it went to the third prize winner, and the second prize winner received $10 in gold. On this basis, the Southern awarded 28 motor cars in 1926, 66 $20 gold pieces and 65 $10 gold pieces.

New York Central (Buffalo & East) Follows Special System

In making the track awards on the New York Central, (Buffalo & East), this road follows a plan of dividing its track sections into classifications and groups, each group within each classification containing only sections similar in character. The awards made in connection with this system are in the form of premiums added to the regular monthly compensation of the winners. Thus, the foremen who receive the highest marks in their respective groups are awarded a premium of $5 a month. In a similar manner the foreman receiving the highest mark in each classification is awarded an additional premium of from $2 to $3 a month. Supplementing these awards, $10 gold pieces are given to the foremen who have received the highest marks in their respective groups for four consecutive years. The foremen who received the classification premiums are as follows:

Classification 1, John Andros, sub-division 3, Eastern division.

Classification 2, A. W. Allen, sub-division 24, Pennsylvania division.

Classification 3, J. Nelson, sub-division 26, Pennsylvania division.

Classification 4, J. Shubell, sub-division 13-A, Buffalo division.

Classification 5, J. Crzybeck, sub-division 13, Buffalo division.

The sub-division receiving the highest rating of the year was 13-B of the Buffalo division, of which J. P. Sexton is supervisor, with a rating of 85.0. The second and third highest sub-division ratings were given respectively to sub-division No. 10 of the Syracuse division, W. N. Skelton, supervisor, 84.8, and sub-division No. 13 of the Buffalo division, T. J. Sexton, supervisor, 84.6. The highest division rating was to the Buffalo division with a grade of 84.8, while the second highest division rating was given to the Eastern division with a grade of 83.3.

Norfolk & Western Awards 80 Prizes

Over 80 prizes were again awarded on the Norfolk & Western as a result of its annual track inspection. These prizes were, first, $40; second, $30; third, $20; and fourth, $10 and were awarded on each supervisor's subdivision for general excellence of roadway and track maintenance. Several additional prizes were also awarded to meet special conditions on branch lines and in terminals. Specifically, the various ratings given were based on line and surface; switches, frogs and road crossings; ditches and roadbed; right-of-way; station grounds; and fences; each class of work being adjudged separately and a total rating of 10 being considered as perfect.

Prize Winners on the Pennsylvania,

Track inspections on the Central region of the Pennsylvania resulted in the award of the first prizes of $800 and $400, respectively, to C. F. Miller, supervisor, and C. P. Willis, assistant supervisor, on the Pittsburgh division, at Gallitzin, Pa., their subdivision having been adjudged the best maintained in the entire Central region during the year. The two next highest prizes of $600 each, awarded to supervisors having the best maintained tracks on a main line superintendent's division, were won by D. E. Callahan, supervisor on the Eastern division at Pittsburgh, Pa., and J. C. Dayton, supervisor on the Panhandle division at Newcomerstown, Ohio.

Additional prizes of $100 each were awarded to the following branch line supervisors.

J. L. Conover, Buffalo division, Olean, N. Y.
P. X. Geary, Allegheny division, DuBois, Pa.
W. G. Kemmerer, Renovo division, Emporium, Pa.
F. H. Rothe, Pittsburgh division, Pittsburgh, Pa.
B. M. Frymire, Conemaugh division, Freeport, Pa.
W. R. Parvin, Monongahela division, Youngwood, Pa. (now supervisor at Jersey City, N. J.
James Foley, Wheeling division, Wheeling, W. Va.
G. H. Schlotterer, Cleveland & Pittsburgh division, Ravenna, Ohio.
J. J. Westlake, Erie & Ashtabula division, Mahoningtown, Pa.
M. J. Bray, Akron division, Orrville, Ohio.

Mike E. Boyle, supervisor on Subdivision 3 of the St. Louis division of the Pennsylvania, Western region, Greenville, Ill., was the winner of the $800 prize awarded after the annual track inspection for the subdivision having the best line and surface in the region, this being the sixth time that he has headed the list of prize winners. Delphi Lewis, supervisor on Subdivision 4 of the Columbus division, Richmond, Ind., won the improvement prize of $700 for having made the greatest improvement

in track during the year in the entire Western region.

In addition to the above, division prizes for the subdivisions having the best line and surface on a division were awarded to E. B. Kirchner, supervisor, Subdivision 3 of the Fort Wayne division, Van Wert, Ohio; Thomas Binkley, Jr., supervisor, Subdivision 1 of the Cincinnati division, Xenia, Ohio; and Charles McCarthy, supervisor, Subdivision A of the Logansport division, Union City, Ind.

Hocking Valley Uses Erie Test Car

After abandoning the annual track inspection during 1925 on account of a heavy second tracking program, the Hocking Valley resumed track inspections in 1926 and awarded prizes as in previous years. A new feature in the latest inspection was the use of the Erie's test car for recording, low joints, cross level and gage.

This inspection formed the basis for the award of prizes of $100, $75 and $50 to supervisors whose districts received the first, second and third highest grades on the railroad. Similarly the section foremen whose sections were given the first, second and third highest grades on each supervisor's district received prizes of $50, $25 and $10, respectively. The prize winning supervisors are F. A. Sparks, District No. 2, with headquarters in Marion, Ohio, $100; F. A. Matthews, District No. 3, with headquarters at Columbus, Ohio, $75; and E. C. Snouffer, District No. 1, with headquarters at Fostoria, Ohio, $50.

Special Instrument Assists in Making Awards on the Long Island

Following the twentieth annual track inspection on the Long Island, a total of $1,150 in cash prizes was awarded to the supervisors and foremen having the best maintained divisions and sections during the past year. For the second consecutive year, R. L. Haring, supervisor of Division No. 2, with headquarters at Jamaica, L. I., won the "Klondike" prize of $200 for having had the best line and surface on his track throughout the year. The second prize of $100, awarded on the same basis, was won by W. M. Steers, supervisor of Division No. 5, with headquarters at Hicksville, L. I. A special prize of $100 for the division showing the greatest improvement in track conditions during the year, was won by F. J. Nehrhoff, supervisor of Division No. 4, whose headquarters are at Patchogue, L. I.

In addition to these prizes, five foremen received prizes of $100 each, and five others, $50 each.

As in the past three years, the awards for 1926 were based upon the annual inspection and the bimonthly inspections made by a special "Marking Committee." A feature of the inspections made during 1926, however, has been the use of an instrument on the inspection train which shows the irregularities in both the alignment and surface of the track.

R. F. & P. Makes Cash Awards

Following its customary practice, the Richmond, Fredericksburg & Potomac again awarded two groups of prizes to its section foremen in 1926 as a result of its annual track inspection. One of these groups of prizes was awarded on the basis of the best track maintenance during the year, while the other group of prizes was awardd on the basis of the lowest cost per mile per point of the rating given each section. The first set of prizes, based on quality of maintenance, included awards to the following section foremen:

First prize, $100, W. W. Lowry, Elmont, Va.
Second prize, $80, R. B. Blank, Richmond, Va.
Third prize, $60, E. D. Carneal, Rixey, Va.
Fourth prize, $40, L. T. Surles, Fredericksburg, Va.

The second set of prizes, based on the cost of maintenance, was awarded to the following section foremen.

First prize, $100, L. T. Surles, Fredericksburg, Va.
Second prize, $80, E. L. Pugh, Ashland, Va.
Third prize, $60, A. B. Cox, Guinea, Va.
Fourth prize, $40, B. J. Toombs, Milford, Va.

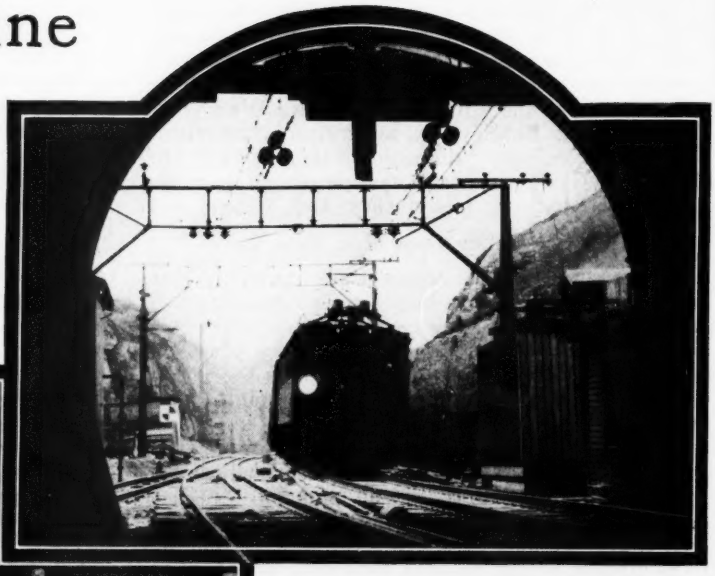
Canadian Pacific, Eastern Lines, Awards 64 Prizes

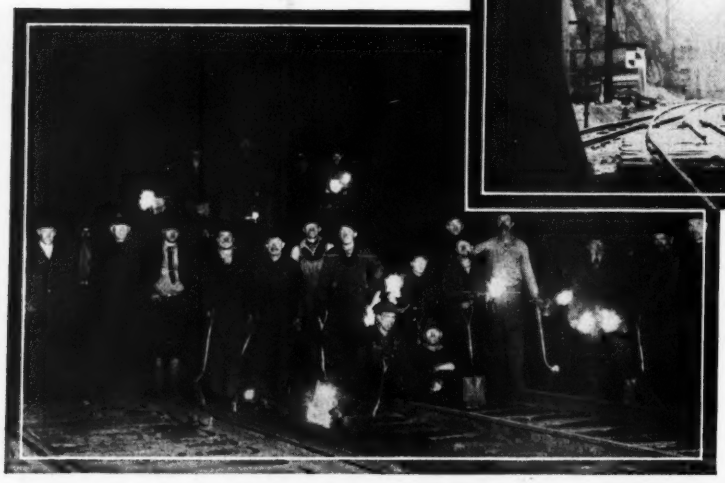
Track awards on the Eastern lines of the Canadian Pacific included a general manager's prize, 4 general superintendents' prizes, 14 division superintendents' prizes and 45 roadmasters' prizes. These prizes, which are respectively $100, $50, $25 and $10 each, were awarded to track foremen who maintained the best sections throughout the year, consideration being given also to the amount of work accomplished and the economy with which it was effected. In each case the winner of one of the larger prizes was excluded from consideration for the smaller prizes. The general manager's prize for the year was awarded to A. Morin, Mont Rolland, Que., on the Laurentain division, Quebec district, while the four prizes awarded by general superintendents were won by D. Thomas, Waweig, N. B., St. Andrews sub-division, Woodstock division, New Brunswick district; S. Godin, Low, Que., Maniwaki sub-division, Ottawa division; I. Munt, Darling, Ont., MacTier sub-division, Bruce division; and J. Chamberlain, Algoma, Ont., Thessalon sub-division, Sudbury division.

Copyright, 1926, by H. C. Fisher, Trade Mark Registered U. S. Patent Office. Reproduced through courtesy of the Chicago Daily News.

When Jeff Takes a Job as a Track Walker

Boston & Maine Increases the Clearances in Hoosac Tunnel





Enlarges Dimensions of 25,081-ft. Bore in Short Time, Without Accident or Traffic Interruption

Some of the Men Who Did the Work

"OUT OF the trenches by Thanksgiving." This was the slogan of the Boston & Maine forces as under the most severe and hampered conditions they drilled and blasted through the historic double-track Hoosac tunnel to give that structure increased clearances in order to accommodate the enlarged modern equipment which for several years has been turned back at its portals. And significant enough, the date was met, for on Thanksgiving morning the last shift of forces emerged from the tunnel and the enlarged bore, sufficient to carry the largest registered cars of the country over two tracks simultaneously, was completed.

This accomplishment is of interest for several reasons. Just 53 years previous, on November 27, 1873, the original tunnel builders brought the east and west headings together with an error of but 9/16 in.; the present work had been completed in 106 consecutive days; 7,600 cu. yd. of rock and earth had been removed from the face and bed of the tunnel, notwithstanding an average movement of from 40 to 50 freight and passenger trains through the tunnel daily; and of no less significance, the entire work was completed without interference to traffic, and without injury to any member of the tunnel force.

The tunnel is situated in northwestern Massachusetts on the Fitchburg-Berkshire division of the Boston & Maine, about 50 miles from Troy, N. Y., and 136 miles from Boston, and passes through the Hoosac mountain from which it derives its name. For its entire length it is straight and passes through solid rock, principally mica schist and quartz. Owing to this, practically 17,450 ft. is without lining, the remaining portion having been lined with a brick arch about 2 ft. in thickness in sections ranging from 10 ft. to 2,745 ft. in length, it having been put in, apparently, where soft rock was encountered or where water conditions were the most severe. One of the main sections of this lining is at the extreme west end of the tunnel where for about 1,000 ft. it takes the form of a complete invert. The gradients throughout the tunnel are 0.5 per cent ascending, and extend from each portal to the center ventilating shaft. These gradients permit drainage of the tunnel, which has always been a matter of importance since the discharge at the east portal has continued for years at approximately 100 gal. of water per minute, while that at the west portal has amounted to about 600 gal. per minute. In taking care of this water, the east end of the tunnel is equipped with a 12-in. tile pipe, extended for some distance with a 9-in. by 10-in. wood box, while the west end is fitted with a 2-ft. by 2-ft. stone box drain. In each case these drains are located in the center of the tunnel, with their tops only a few inches below the bottom of the track ties.

The tracks throughout the tunnel were originally laid 11 ft. 6 in. center to center and as far as possible an effort has been made to maintain this distance. Owing to the insufficient clearances within the tunnel, however, it has been necessary to line the tracks closer together at some places, which has resulted in irregular alinement.

For the last 15 years operation through the tunnel has been electrified, six large electric locomotives being used to haul trains and their road locomotives through the tunnel so as to preclude the accumulation of smoke and gases which had previously ex-

isted, dirtying equipment and causing discomfort to passengers. Power for the electric operation is carried in two 11,000-volt a. c. overhead trolley wires which have been suspended from the crown of the tunnel since 1911, decreasing the clearances.

Insufficient Clearances Necessitate Detouring Larger Cars

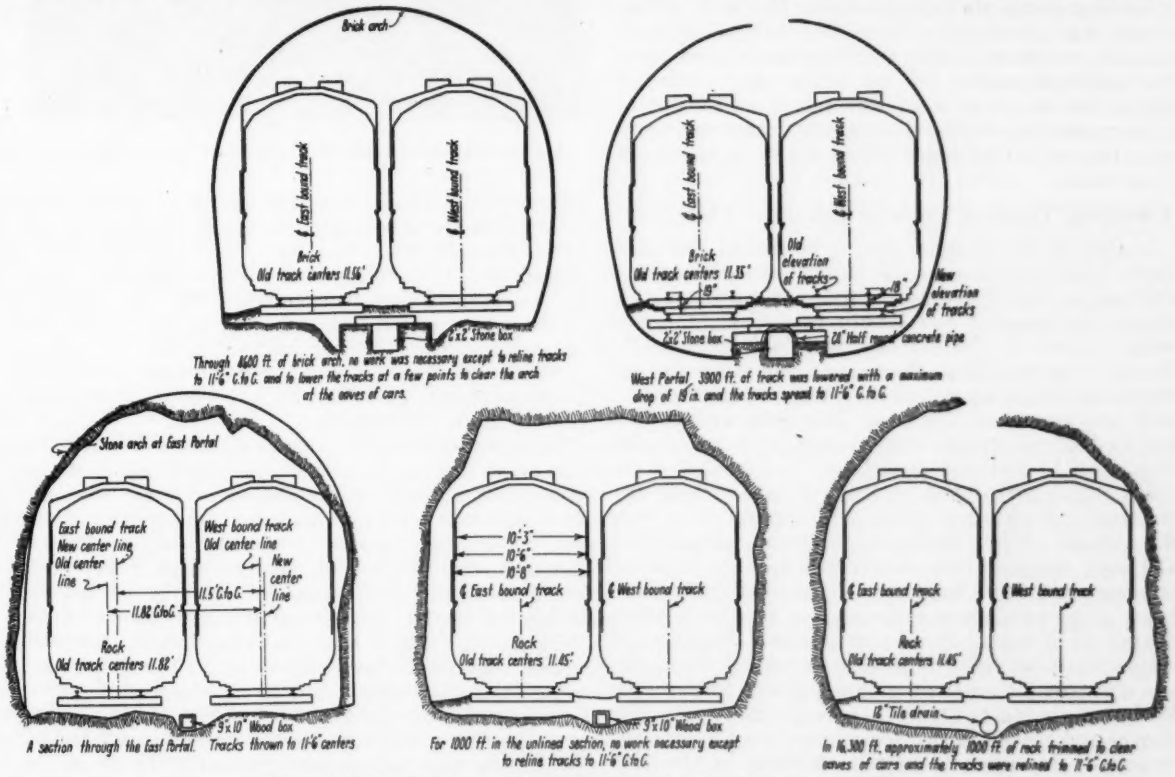
As a result of the insufficient clearances within the tunnel, the Boston & Maine has been put to large expense and inconvenience during recent years. It has been necessary to break up trains and detour all of the larger cars around the tunnel, over the Rutland, a distance of approximately 35 miles.

After about six months of surveying, calculating existing clearances, and other preliminary work, the actual work of enlarging the tunnel was begun, it having been decided in the new project to provide a minimum vertical clearance of 16 ft. 3 in. between the top of the rails and the trolley wires, with the tracks at a uniform distance of 11 ft. 6 in. center to center. With the side clearances sufficient, except at a very few places, it was found that the work to be done within the tunnel grouped itself into about four main classes, the heaviest part being required at the west end. Here it was necessary to increase the existing vertical clearance from a few inches to a maximum of 19 in. over a distance of about 3,900 ft. The other work included the trimming of about 1,000 ft. of rock through 16,300 ft. of the unlined portions of the tunnel, and the lowering of the track slightly throughout about 4,600 ft. of the brick lined sections. This lighter work was necessary in each case in order to provide a height within the tunnel sufficient to clear the eaves of the larger cars, with the tracks 11 ft. 6 in. center to center. About 1,000 ft. of the tunnel required no work other than relining the tracks to the new track centers established.

From the existing conditions it was evident that the main enlargement work was one of lowering the floor of the tunnel rather than cutting out overhead, particularly in view of the trolley construction and the fact that the heavy work necessary at the west end was in the brick lined portion where the conditions made it impractical to disturb the lining.

As the Fitchburg-Berkshire division of the Boston & Maine, carries about 45 per cent of the Boston & Maine's traffic, which could not be interfered with, it was necessary to keep one track within the tunnel open at all times and to confine all enlargement work to the side not in service. Following this plan, work on the tunnel was begun on August 11, 1926, when the forces were given uninterrupted use of the westbound track. The first work was started about 600 ft. west of the west portal where it was necessary to begin lowering the tracks. This work on the approach to the tunnel consisted principally of stripping the roadbed and cutting down to the new grade, after which the track was put back into place and resurfaced.

Within the tunnel the operations were not as simple or as easily executed. Here, restricted by the small side and overhead clearances, and hampered by the overhead trolley and the heavy traffic on the eastbound track, each operation had to be carefully timed and executed with all of the forces on the alert to meet any emergency and to keep out of danger. Adding to the difficulties encountered and the hazards of the work, the tunnel was cold, dark and damp, and in spite of the use of high power electric lamps about the work, it was often difficult to see more than 30 ft. in either direction owing to the foggy conditions which frequently existed. Likewise, it was difficult to hear the approach of trains, particularly when drilling was under way, which made it all the more essential to exercise care in each



Typical Cross Sections of Tunnel Showing the Alterations Made

operation. In order to permit the timing of work with respect to the movement of trains, and in order to insure the safety of the men under these conditions, advance reports of train movements were furnished regularly by telephone to the tunnel gangs, and flagmen were stationed each side of the work to announce the immediate approach of trains, which was done with mouth whistles.

Special Forces and Equipment Used on the Work

Anticipating these conditions, and yet desiring to complete the work before winter set in, the most experienced forces on the Boston & Maine were assigned to the work. To a considerable extent these forces included the mining gang regularly employed in the tunnel, the section forces accustomed to tunnel work, and engineers and electricians familiar with the conditions to be met. The total number of men employed ranged from 125 to 150, which was as many men as could be utilized effectively within the tunnel, based on three 8-hour shifts on the major excavating project.

The equipment used in the major floor-lowering work within the tunnel consisted mainly of an air-operated shovel equipped with a special short boom and a clam-shell bucket, and jack hammers and paving breakers for drilling blast holes and for trimming operations. Air for the operation of this equipment was generated in a temporary compressor plant set up at the west portal, and was conveyed to the various units in a steel pipe line fitted with working extensions of rubber hose. The removal of the material from the tunnel was accomplished by the use of small flat cars, similar to section push cars, which were hauled to and from the cutting operations on a narrow gage track by a special type of gasoline-operated chain-drive motor car fitted with a drawbar.

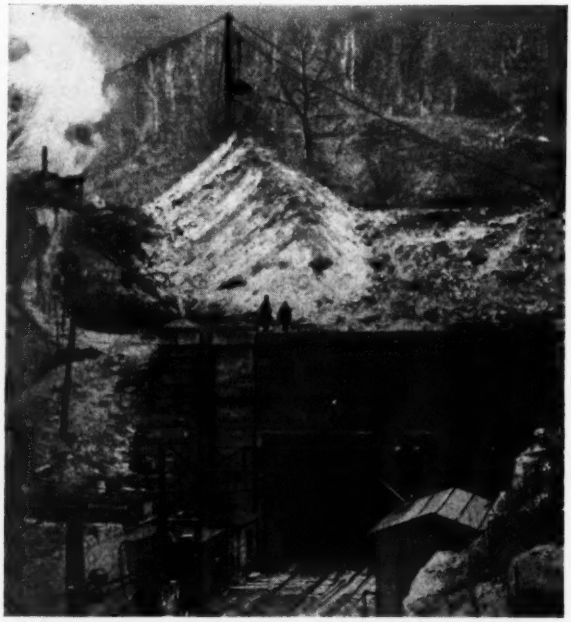
The overhead and side wall trimming necessary at various places throughout about 16,300 ft. of the tunnel, was accomplished with the paving breakers and jack hammers which were operated from portable stagings moved on the track rails. The air supply for this equipment was furnished by one of the company's portable tie-tamping compressor outfits which could be kept within range of the work at all times.

Lowering Track to Increase Overhead Clearance

In the actual cutting down of the tunnel floor, the shovel was backed into the tunnel, completing the work as it moved inward. First, the track was removed for about a rail length at a time, the rail being thrown to the side to be relaid later, while the ties were loaded on the narrow gage cars and removed from the tunnel as they were to be replaced with new creosoted pine ties. The old gravel ballast and bed of the track were then picked up by the clam shell bucket and placed on the two-yard scale boxes which were used on the flat cars to hold the material and afford a means of handling it outside the tunnel. When the surface of the tunnel floor had been stripped, holes were drilled in the rock for blasting, care being taken to so place and incline the holes as to produce a minimum of scatter. When danger of flying rock was anticipated, heavy rope mattresses were used to prevent damaging the catenary construction or fouling the opposite track. Following each blast, the rock was picked up by the shovel and placed in the scale boxes on the cars for removal. In order to permit spotting of the cars within reach of the shovel, the narrow gage track was extended over the new ties of the main track as it was rebuilt, by gangs who followed up the rock cutting operation as closely as practical. Near the inner end of the narrow gage track, a portable turnout and stub track made it possible to spot four or five cars for loading while the motor car hauled a similar number of loads from the tunnel for disposal. As the work progressed, the narrow gage track was extended and the turnout moved forward to a new location within loading distance of the shovel.

Concrete Pipe Replaces Old Drain at West End

Another important part of the work within the tunnel at the west end was the removal of the stone box drain which carried the entire drainage of the west half of the tunnel. This work was necessary in connection with the enlargement of the tunnel due to the fact that the top of the original drain was above the new grade line for the bottom of the ties. The old drain was therefore removed and replaced by a 15-in. reinforced concrete pipe, the work involving some difficulties owing to the large amount of the water which had to be taken care of and the necessity of lowering the bottom of the old culvert a maximum of 12 in., for a considerable part of its replaced length, in solid rock, in order to lay the new pipe to the revised grade.



A Cableway Was Used to Dispose of Waste Material

In doing the work it was necessary to remove the top slabs and side walls of the old drain, and this was accomplished by the shovel after the masonry was shattered with jack hammers and paving breakers. With this masonry removed and the bottom lowered, the sections of concrete pipe were set in place with the joints slightly open to permit the inflow of water. Following the installation of the new drain, backfill was made with the trap rock which was used as new ballast under the ties, replacing the gravel which had been removed.

While this work was going on, the trimming gang was operating throughout the tunnel, breaking off projecting rock which interfered with the clearances sought. In some places this involved only slight

cutting while at other places a considerable amount of rock had to be broken away in order that proper clearance would be secured after the tracks were lined to the new centers. On October 10, the work on the westbound track was completed and, with traffic shifted over, similar operations were carried out on the eastbound track, working in three shifts on the major floor-excavating job until the work was completed on the morning of November 25. In all, a total of about 3,300 yd. of rock and 4,300 yd. of old ballast and dirt had been removed.

Cableway Handles Material to Spoil Banks

As it was not possible to use the material taken from the tunnel in strengthening or widening embankments without interfering with traffic, a rather unusual method on railroad work for disposal was adopted. This involved a cableway which was used to carry the spoil to waste banks on the hillside back of the west portal. In disposing of the excavated material in this manner and at the same time to prevent dumping directly over the tunnel, and thereby increasing the load upon it, as well as to avoid possible contact with live wires, the cableway was first run out at about 45 deg. to the south of the line of the tunnel while handling the spoil removed from the westbound side, and then shifted to a position about 45 deg. to the north of the tunnel for handling that removed from the eastbound side. Extending over the portal in each case, the cable carriage was run down directly over the narrow gage cars and the sling lowered and connected to one of the scale boxes, which was then hoisted and carried back over the spoil bank and dumped. The power for the operation of the cableway was furnished by a 30-hp. steam hoisting engine installed on the hillside back of the portal. This equipment was operated by a hoisting engineer who governed the movement of the carriage in accordance with bell signals which were received over a circuit originating at the west portal.

The enlarging of the Hoosac tunnel is one of the major projects being undertaken by the Boston & Maine in the rebuilding of its 187 mile line between Mechanicville, N. Y., and Boston to permit the unrestricted handling of the largest and heaviest loads over the line with its Santa Fe type locomotives.

The work within the Hoosac tunnel was handled entirely by Boston & Maine forces under the general supervision of W. J. Backes, engineer maintenance of way, who was represented in the field by J. P. Canty, division engineer; W. L. Shanks, track supervisor; E. B. Tourtellote, assistant supervisor bridges and buildings, and G. A. Haskins, assistant engineer, reporting to Mr. Canty, who had direct charge of the forces and the execution of the project. Plans and estimates were prepared under the supervision of F. C. Shepherd, chief construction engineer.

Railway Activities in 1926 Set New Records

NEW LINES constructed in the United States in 1926 exceeded 1,000 miles for the first time since 1916, while the lines under construction and those projected give promise that the total for 1927 will exceed that of last year. The construction of second track showed a recession from the previous year but such budgets as are available at this early date indicate renewed activity in this form of construction that will probably approach the total for 1925 when 682 miles were built, the amount for any single year since 1913. This data and others which are given below are taken from a review of railway construction during 1926 and a forecast for 1927 published in the Annual Statistical Issue of the Railway Age for January 1.

Railroad Construction

Railroad construction during 1926 totaled 1,005 miles of first track, exceeding the total for 1925 by 361 miles, or 55 per cent. For the first time in recent years much of the new line mileage consisted of relatively long lines, such as the 145 miles built by the Southern Pacific in Arizona and the 93-mile line of the Oregon Short Line in Idaho and Nevada, which were built primarily to provide new routes for the economical handling of traffic. Other lines, such as the 242 miles built by five different companies in Texas, were designed principally for the purpose of opening up undeveloped territory. Regardless of the reasons prompting the contruction of these lines the railroads have shown their faith in the future by also making heavy expenditures for other improvements in their endeavor to continue the efficiency they displayed in handling the unprecedented traffic of 1926 with almost no congestions and with an almost complete avoidance of car shortages. The capital expenditures for improvements by the Class I roads for 1926 totaled $875,000,000, according to figures completed by the Bureau of Railway Economics, an increase of more than $125,000,000 over similar expenditures for 1925, and approximately the same as for 1924. The capital expenditures for roadway and structures amount to $495,000,000, an increase of almost $85,000,000 compared with 1925.

Canada showed a decrease in new line construction with 335 miles as compared with 414 miles in 1925. Mexico also showed a decrease in construction, reporting a total of only 27.5 miles, against a total of 132 miles in 1925, the practical completion of the west coast extension of the Southern Pacific of Mexico accounting for a large part of the decrease.

Contrasted with the large construction of new lines, the second track constructed in 1926 showed a marked decrease from that built in 1925, the total for 1926 amounting to 473 miles against 682 for the previous year. Almost half of the mileage of second track built in 1926 was in Florida, the Florida East Coast building 113 miles to complete its double tracking between Jacksonville and Miami and the Atlantic Coast Line building 75 miles in congested territories, the longest stretch being 56 miles between Chatmar and Dade City, while the Seaboard Air Line built several stretches aggregating 34 miles. The Union Pacific completed the double tracking of its main line between Council Bluffs, Iowa, and Ogden, Utah, by building 26 miles between Glen Echo, Utah, and Gateway. Aside from these projects the mileage of new second track was made up of relatively short stretches, as in Ohio, where 101 miles were built by six different roads. The several major

projects completed in 1925 undoubtedly supplied the more imperative needs for the time being while a more intensive use of facilities, made possible by heavier and faster power, the increasing use of locomotive boosters, the installation of signals, interlocking and the remote control of outlying switches served to postpone the construction of some second track which otherwise would have been necessary.

Grade Reduction

Large sums were expended during the year for grade reduction or for the construction of new lines to furnish easier grades for existing and prospective traffic. The new lines of the Southern Pacific in Arizona, California and Oregon were built largely to provide easier grades and work progressed throughout the year on the Edgewood, Ill., to Fulton, Ky., line of the Illinois Central which will have materially lighter grades than the old main line which it will supplement. The Chesapeake & Ohio started work late in the year on a double-track, low-grade line 63 miles long between Gregg, Ohio, and Valley Crossing to handle its heavy coal traffic. An outstanding grade reduction project was begun during the year by the Great Northern, which is boring a tunnel 7.75 miles long through the Cascade mountains in Washington, which will save 7.67 miles in distance and eliminate a large amount of 2.2 per cent grade, substituting in its place the tunnel grade of 1.53 per cent. Work progressed in a satisfactory manner during the year on the Moffat tunnel in Colorado which will afford the Denver & Salt Lake an easier crossing of the Continental divide and it is expected that the tunnel will be completed in 1927.

Yards and Terminals

New yards and engine terminals were responsible for larger expenditures during 1926. The Markham yard of the Illinois Central near Chicago, built at a total cost of $12,000,000, was completed and placed in service early in the year. The Florida East Coast made extensive outlays for freight and engine terminals at Jacksonville, St. Augustine and Miami, as well as at intermediate points. The Pennsylvania, the New York Central, the Baltimore & Ohio, the Reading, the New York, New Haven & Hartford, the Norfolk & Western and the Chesapeake & Ohio are among the other roads which expended large sums for work of this character.

While large amounts were spent on passenger stations in the aggregate the only large project of this nature to be completed during the year was the station of the Boston & Albany at Springfield, Mass., costing $4,000,000. The New York Central began work on terminal improvements at Buffalo, N. Y., which include the erection of a new passenger station and which will require a total outlay of $14,000,000.

Track elevation and grade separation continue to require large expenditures, not only in the large cities but in the smaller cities and in the country as well. Work of this character was begun during the year by the Indianapolis Union in Indianapolis, Ind., which calls for an ultimate outlay of $13,000,000, while the track elevation program of the Pennsylvania and the Baltimore & Ohio in South Philadelphia will cost $25,000,000 on completion.

Abandoned Lines

As might be expected in a year of industrial activity and heavy traffic the mileage of lines abandoned shows a decrease from 1925, the total for the United States being 457 miles compared with 606 miles in 1925. With the exception of the mileage of short branches abandoned in New England because of motor bus and motor truck competition the lines abandoned consisted for the most part of short lines and branches built to serve timber and mineral resources which have become exhausted. For the first time in 10 years the mileage of new lines built exceeded the mileage abandoned by a substantial margin. Canada reported a slight increase of abandoned lines, the total of 72 miles in 1926 compared with 63 miles in 1925.

Large Amount of Automatic Signals and Interlockers Installed

To provide for a more intensive use of existing facilities block signals were installed on 4,994 miles of road in the United States and Canada, establishing a new record and showing a marked increase over the 2,938 miles installed during 1925, which was the maximum for 10 years past. Although signal construction in Canada was rather limited from 1915 to 1924, several installations made in 1926 total over 100 miles.

Interlocking construction for the year also established a new record by the installation of 1,910 levers at 134 new plants while 736 levers were installed for replacements at various locations. These figures do not include 194 levers and 89 switch machines for remote control. Other devices for speeding up the operation of trains and of permitting an increase of tonnage by eliminating stops, especially on grades, are found in spring switches which have been installed by nine roads at yard and passing track switches and at the end of double track, and in the increased use of remote control of outlying main track switches, 47 such layouts having been completed in 1926. Savings as high as $5,000 a year have been reported for single installations of spring switches while a single remote switch control layout has effected savings amounting to $10,000 a year. During the year the Great Northern placed in operation a unique automatic interlocking at Minot, N. D., whereby the operation of a switch at the end of double track is controlled by high speed approaching trains on the single track or on either of the double tracks, this installation dispensing with the services of three shifts of switch tenders daily.

Car retarder installations were placed in service during the year at three yards on the Illinois Central, at two yards on the Indiana Harbor Belt and at one yard on the New York, New Haven & Hartford. With the experience of nearly a year's operation it is expected that several other roads will install car retarders in 1927.

Much progress was made during 1926 on the installations of train control to meet the orders of the Interstate Commerce Commission with the result that at the end of the year all but five of the installations required by the commission's first order were completed and 23 roads of the 36 listed in the second order had their installations in service.

Traffic Establishes Many New Records

The freight traffic of the railways of the United States in 1926 was the greatest in the history of the railroads and in handling this traffic the following records may be cited:

The greatest number of revenue cars loaded (53,260,000), an increase over 1925 of four per cent and over 1923, the next highest peak year, of nearly seven per cent. These figures represent for the first time a weekly average for a year of more than a million cars.

The greatest number of revenue cars loaded in a single week, the loadings for the week of November 1,

reaching a total of 1,216,432, exceeding by 91,296 cars the best record in previous years, established for the week ending August 29, 1925. The highest previous monthly totals were also surpassed in 1926,

The net ton miles, which include non-revenue freight, were 488,000,000,000, an increase of 7 per cent over the total for 1925, and of 6.6 per cent over the total for 1923. The greatest freight traffic for any one month was carried in October when the net ton miles amounted to 48,273,000,000, exceeding the previous record of 44,062,000,000 net ton miles in October, 1925.

The average daily car movement was higher for every month of 1926 to October (figures for November and December are not yet available), than during the corresponding months of 1925, this movement reaching an average of 34.3 miles per day in October and exceeding by 2.1 miles the record established in October, 1925.

The number of miles per freight locomotive per day to October, 1926, averaged 61.3 miles as compared with an average of 58.2 miles for 1925.

The average net tonnage per freight train also established a new record for the month of October, 1926, averaging 829 tons as compared with the previous record of 796 tons in August, 1925.

New low marks were established during 1926 in fuel consumption for both freight and passenger locomotives. For the first 10 months an average of 134 lb. of fuel was used to move 1,000 gross tons of freight as compared with 138 lb. in 1925, and 148 lb. in 1924. The fuel consumed per passenger train car mile was 15.6 lb. for the first 10 months, compared with 15.9 lb. in 1925.

The net operating income of the Class I roads of the United States was $1,250,000,000, an increase of $113,000,000 or 9.9 per cent over the net operating income for 1925, and representing a return of 5.21 per cent on the property investment, as compared with 4.84 per cent in 1925, 4.33 per cent in 1924 and 4.48 per cent in 1923.

Equipment Orders Were at a Low Level

Equipment orders remained at a comparatively low level during the year although there was a slight increase in the orders placed for locomotives, rail motor cars and highway motor vehicles as compared with 1925. The number of locomotives ordered totaled 1,301, an increase of 246 over the 1,055 ordered in 1925, and the number of locomotives actually built for domestic use, including Canada, amounted to 1,585 as compared with 994 built during the previous year. The number of new passenger cars ordered during the year was 1,868 as compared with 2,191 in 1925, and the number of passenger cars actually built was 2,184 as compared with 2,363 in the previous year. The purchase of freight cars also declined, only 67,029 having been ordered during the year, against 92,816 ordered in 1925, and only 88,862 were actually delivered as compared with 105,935 delivered in 1925. In addition to this equipment the railroads also ordered 158 rail motor cars and trailers in 1926, as compared with 149 in 1925. The number of motor buses ordered in 1926 amounted to 151 while orders were placed for 82 other highway motor vehicles, these figures comparing with 125 and 37, respectively, in the previous year.

Prices of railway supplies and equipment were generally steady throughout 1926 at slightly lower levels than in the previous year. Prices of track materials such as bolts, spikes and tie plates were slightly lower than in 1925 as was also the price of structural steel plates, but the fluctuations in price from month to month were negligible. In the tie market increases were effective in numerous instances due to a variety of causes, prominent among which may be cited the absence of a competitive market, the rains of the previous winter in the south and the diminished production of hardwood ties in Minnesota and Wisconsin due to the inability to dispose of the waste economically. In the south the low price of cotton is expected to result in a larger production of ties which will tend at least to prevent higher prices. Several new plants for the treatment of ties were placed in operation during the year and as a result of the increasing use of treatment the number of ties purchased each year continues to decline while the proportion of the better grades of ties to the total continues to increase.

What of 1927?

Based upon studies of present and prospective traffic, statements of railway and industrial executives and the budgets of 27 representative railroads, the outlook for 1927 is that expenditures for additions and improvements to property will be about the same as they were for 1926. The new line construction should equal, if not exceed, the total for 1926. Among the large projects are those of the St. Louis-San Francisco for the construction of 152 miles to connect its Birmingham line with the Muscle Shoals, Birmingham & Pensacola line which it recently acquired. The Chicago, Burlington & Quincy, through its subsidiary, the Colorado & Southern, has been authorized by the Interstate Commerce Commission to construct 200 miles in western Texas and the Quanah, Acme & Pacific has also been granted permission to build a 27-mile line in that same territory. The Southern Pacific and the Missouri Pacific will continue the construction of new lines in Texas near the Rio Grande. The Chesapeake & Ohio contemplates the construction of lines aggregating 79 miles in length, while the Reading, the Atchison, Topeka & Santa Fe, and the Denver & Rio Grande Western are among other roads which have made appropriations for new lines. The Detroit, Toledo & Ironton will continue work on its Durban-Malinta line and the Illinois Central expects to complete its 165-mile line from Edgewood, Ill., to Fulton, Ky., during the present year.

The budgets for the present year contain many projects for second track, among which may be cited 45 miles to be built by the Chesapeake & Ohio. The Southern Pacific has provided for the construction of 52 miles; the Delaware, Lackawanna & Western for 16 miles, and the Chicago, Burlington & Quincy for 22 miles; while the Chicago & North Western contemplates the construction of 100 miles. Other roads which have provided for additional main tracks are the Pennsylvania, the Reading, the Denver & Rio Grande Western and the St. Louis-San Francisco.

The indications are that even larger sums will be expended in 1927 for additions to and improvements of freight terminal yards than were spent in 1926. Among the roads which have appropriated from $1,000,000 to $5,000,000 for this purpose are the Norfolk & Western, the Southern Pacific, the Delaware, Lackawanna & Western, the St. Louis-San Francisco, the Minneapolis, St. Paul & Sault Ste. Marie and the Chicago & North Western. Large expenditures will be made also for new passenger stations and freight stations. On the other hand less will probably be spent for shop buildings than in 1926.

What's the Answer?

What Our Readers Have to Say on Current Questions That Perplex Those Engaged in Maintaining Tracks, Structures and Water Supply Facilities

QUESTIONS TO BE ANSWERED IN THE MARCH ISSUE

1. *Should a separate kit of tools be furnished section gangs for use in repairing or installing frogs and switches; if so, what tools should be provided?*

2. *What uses may be made of portable air compressors by bridge gangs, aside from riveting?*

3. *Should released rail be classified for relaying before it has been loaded or should the classifying be done at some central point?*

4. *What is the best method of removing water from scale pits or similar pits, where the cost of a drainage line would be prohibitive?*

5. *Are manganese switch points safe and otherwise satisfactory for use in main tracks handling fast and heavy traffic?*

6. *In unloading crushed stone or gravel for concrete what precautions, if any, should be taken to prevent the segregation of the larger particles?*

7. *To what extent can the distribution of ties be done more economically by motor cars and trailers than by work train?*

8. *What special precautions should be taken where water mains are laid under tracks carrying heavy traffic?*

Fastening Tie Plates to the Ties Independent of the Rail

What are the advantages, if any, of fastening tie plates to the ties by lag screws or spikes, independent of the spikes that hold the rail in place?

Fastening the Tie Plates Independently Reduces Wear on the Ties

By G. J. Ray
Chief Engineer, Delaware, Lackawanna & Western, Hoboken, N. J.

It is my personal opinion that one of the most important reasons for tie cutting, where tie plates are used, has been often overlooked. I refer to the sawing or grinding of the plate into the wood, caused by the lateral pressure and the wave motion of the rail under traffic. Regardless of the size and form of the plate, it has been found that tie plates cut into the ties at a remarkable rate and much faster than one would expect from the concentrated unit load as compared with the resistance of the wood to pressure. At least some who have made a careful study of the subject are convinced, and with them I agree, that the greater portion of the so-called cutting is due to this sawing or grinding effect caused by the constant movement of the tie plate under the load. The looser the tie plate the worse is the cutting. The more room there is for sand and other foreign material to become lodged under the tie plate the more rapid is the wear. Therefore, if this wear can be eliminated the ties should give much longer service.

It seems to me that an ideal construction to avoid this wear may be illustrated by the English style of track, where the rail is supported on a cast chair rigidly bolted or screwed to the tie, these fastenings being entirely independent of the rail fastening. As a rule these chairs are applied to the ties at the treating plant after the ties are treated. They are forced into position under hydraulic pressure, so as to entirely eliminate any movement between the chair and the tie. For many reasons we cannot use the English style of construction and, so far as I know, the nearest we can come to this ideal condition is a properly designed plate of ample dimensions, firmly fastened to the ties by fastenings entirely independent of the fastenings which hold the rail in place. So long as we follow our present methods of track maintenance—renewing ties by spotting them in rather than out of face—we cannot economically bolt our tie plates rigidly to the ties as the English do with their chairs. The next best thing is to fasten these plates with screw spikes. Cut spikes answer the same purpose, but of course are less effective.

In some cases the French have attempted to overcome the wear of the ties by shims placed between the tie plate and the tie. I have personally examined many ties so protected. There is no question but that the shim takes the wear and does materially reduce the destruction of the tie. Personally, I think that the English method is far superior and I prefer our present practice of providing larger tie plates and fastening them to the ties independently of the rail fastening.

Where the tie plates are held firmly in place by fastenings independent of the fastening which holds the rail the former fastenings will not be disturbed by rail movement nor is it necessary to remove these

fastenings when the rail is changed. In some locations such as sharp curves on descending grades we find it necessary to turn new rail by the time it has been in the track a year. In fact the rail is changed many times during the life of the plates. It is a great advantage from a labor standpoint and also saves the ties to be able to change the rail without disturbing the fastening that holds the tie plate to the tie.

What I have said relates primarily to the question of saving ties and labor, but the bolts, lag screws or spikes holding the plates to the tie independently of the rail fastening are also more effective in holding the rail to gage than additional fastenings placed at the base of the rail where they come in contact with the rail.

Does Not Believe There Is Any Advantage

By J. D. KEILEY
Supervisor, Chesapeake & Ohio, Russell, Ky.

There is little or no actual advantage in fastening tie plates to the ties independently of the spikes that hold the rail in place. One of the principal advantages claimed for the separate fastening of the tie plate to the tie, thereby making it theoretically an integral part of the tie, is that this stops the mechanical wear on the tie caused by the plate sinking into it and breaking down the fiber due to the plate working and dirt and grit getting under it. When the plate sinks into the tie and causes the tearing of the tie fibers it is an evidence of faulty design of the tie plate, on account of lack of sufficient area on the tie to support the wheel loads properly or of poor maintenance of the track. Another advantage claimed is that it prevents the plate from rattling and, besides the noise, causes damage to the tie. When tie plates rattle it is due to faulty maintenance and one remedy is to "settle" the spikes, which sometimes is the cause of the rattling.

The function of the tie plate is to prevent mechanical wear from breaking down the fibers of the tie and to preserve the tie strength. The slight advantage gained by fastening the plate separately to the tie would be overcome by the disadvantage of weakening the tie by spike killing. Also, when the tie plates are fastened separately to the tie and new rail of larger or different section is laid, a great deal of damage is done to the ties due to spike driving. The cost of taking up tie plates fastened independently and rearranging them for larger rail would also be a large expense not warranted by the results obtained.

The hook shoulder tie plate which was designed and held to the tie separately had the advantage of not over spiking the tie, but it has a far greater disadvantage in that when wear occurs in the hook there is no way to take it up, whereas when wear occurs under spike heads the wear can be taken up by "settling" the spikes.

The Practice Prevents Loosening of the Plates

By H. A. DOUGLAS
Maintenance Engineer, Longview, Portland & Seattle, Longview, Wash.

It is advantageous to fasten tie plates to the ties by lag screws or spikes independent of the spikes that hold rails in place. Rails which have been spiked over tie plates have a tendency to work loose or be pulled from their original setting on account of the undulatory or wave action of the rail, for the vertical pull is heavy on track spikes, owing to the inability of the ballast, as ordinarily used, to hold the tie in one place. While a great deal of the efficiency expected of the spike is dependent upon the class of tie used, it is assumed that a good grade of ties are in track, for tie plates are inserted for one reason only—to preserve the life of the ties.

Tests show that a 9/16 in. cut spike has a holding power of about 4,130 lb. when driven into a fir tie, while a lag screw of this diameter has a holding power of about 8,800 lb., or more than double. Lag screws offer greater resistance than cut spikes to vertical pull and also to lateral thrust, thereby reducing the liability of derailment. The lag screw, by holding the tie plate and the tie in contact, compels them to rest or move together, although experience has shown that it will work loose, necessitating tightening possibly a few months after being applied. Lag screws used in addition to spikes that hold the rail will reduce maintenance cost, but due care should be taken when applying them to see that the head is supported as fully as possible by the plate.

A common fault in applying lag screws is to bend them over toward the rail or plate by striking them with a maul, as is done by some careless employees with cut spikes, which practice destroys the result desired. Another common practice followed frequently in tracks of minor importance, is to drive a spike against and on the outside of the tie plate, with the head facing toward the end of the tie, and to place another spike under the head at right angles, or parallel with the rail. This is commonly called a "Missouri tie plate" but is expensive, using two spikes where one would suffice, and the desired result of holding the tie plates can be obtained by using lag screws properly applied. Lag screws with a tapered or gimlet body are not as efficient as those with a straight line body, or those with the same diameter throughout the length of the screw, and they should have a length under the head equal to that of the spikes used in track.

Waterproofing Pedestrian Subways

What is the best method of waterproofing pedestrian subways at passenger stations?

Continuous Sheets of Zinc or Copper Embedded in the Concrete Are Effective

By F. H. CRAMER
Assistant Bridge Engineer, Chicago, Burlington & Quincy, Chicago

The greatest difficulties in waterproofing pedestrian subways occur at the construction and expansion joints and the best method of effecting protection is by the use of zinc or copper sheets embedded in the concrete. The sheets should be soldered or brazed to form a continuous barrier to the passage of water and should extend completely through all the concrete of the structure, including the walls of the stairways, which should be provided with end walls. After the subway is completed it should be covered with the usual membrane and mastic waterproofing as an additional protection. In applying the membrane it has been found advantageous to embed a continuous strip of 2 in. by 4 in. timber along the lower face of the footing to serve as a nailing strip and to place a plank on the outside of the membrane, spiking it through the latter to the 2 in. by 4 in. stick to prevent the membrane from being lifted up by the pressure of the dirt due to settlement.

The sheets should be bent in a V-shape at the joints to permit the maximum calculated difference in settlement and the choice between zinc and copper will depend on the probable amount and character of

settlement. If the foundation and loads are such that settlement will be fairly uniform, zinc will answer very well but otherwise copper will be found more satisfactory, since it is more flexible and less apt to tear apart under strain, although its cost is approximately double that of zinc.

A Satisfactory Method of Waterproofing

By J. D. KEILEY
Supervisor, Chesapeake & Ohio, Russell, Ky.

A very satisfactory method of waterproofing concrete pedestrian subways at passenger stations and underground crossings is as follows: The concrete which carries the roadbed and tracks should be given a coating of bituminous mastic or asphalt solution manufactured for this purpose, which should be applied hot. Two-ply waterproofing should then be laid over this, lapping all the joints and using a solution to insure a perfect bond between the strips. Over this should be poured a three-inch slab reinforced with triangle mesh, style No. 28, or its equivalent. After this sand should be applied as thickly as possible, which will act as a cushion, before the track ballast is applied. The side walls and wing walls should be covered with the solution with roofing felt or burlap laid over the solution so as to secure an unbroken surface.

Preferred Size of Stone Ballast

The A. R. E. A. specifications for stone ballast provide for the acceptance of stone ranging from ¾ in. to 2½ in. in size. From the standpoint of track maintenance towards which limit should the preponderance of the stone run?

The Stone Should Contain Equal Proportions Ranging Between the Limits Specified

By J. B. MARTIN
General Inspector of Track, New York Central, Cleveland, Ohio

Ballast stone should be uniformly graded; that is, each car should contain an equal proportion of each size permitted under the specifications and this should be made plain in the specifications so that the producer will not have an excuse for furnishing stone in which there will be an under proportion of any one size in any particular shipment. If a slight deviation is to be permitted, it should be toward the larger sizes.

The principal advantage of stone ballast is the quick drainage it affords, due to the voids. In time these become filled with cinders and disintegrated particles of stone and the drainage is destroyed. If small size stone is used this will occur sooner and the life of the ballast will be shortened. The sizes should be as large as will permit efficient tamping.

The A. R. E. A. minimum size of ¾ in. is rather small and where these specifications are used it would be well to have the preponderance of the stone run toward the larger limit.

The Larger Sizes Will Afford Better Drainage

By ROADMASTER

If no foreign matter such as cinders, dirt or other finely divided foreign materials were ever deposited on stone ballast and if the stone itself did not disintegrate to a certain extent into dust under the blows of the tamping pick, the smaller sizes would be preferable due to the greater ease in maintaining good surface with small lifts. The function of ballast is not only to support the track under the loads imposed by the traffic, but also to drain away the water which falls upon the track in the form of rain. The importance of this feature and the results that follow the failure of ballast to drain properly may be seen in "churned" joints in ballast which has become so fouled with cinders and dirt that the water cannot find its way through it readily.

The larger sizes of stone, because of the distribution and size of the voids between the individual pieces of stone, not only afford better drainage to start with but also permit drainage longer because a longer time is required to fill the voids with the clogging materials that may be deposited on the track. Stone ballast, or, for that matter, almost any ballast will become so foul in time as to require removal and replacement, either with new ballast or with the old material after it has been screened to remove the foreign material. At best this is an expensive process, and for this reason the ballast used should be of such size as to delay as long as possible the necessity of its removal or cleaning.

Excelsior Filters for Water Treating Plants

Has excelsior proved a satisfactory filtration medium for water treating plants? What precautions and limitations should govern its use?

It Has Proved Satisfactory

By WILLIAM M. BARR
Chief Chemist, Union Pacific System, Omaha, Neb.

We are considered by some to be old fashioned in our views on the use of excelsior, but after following the experience of water softener operation on our lines over a period of 24 years, we are convinced that in general excelsior filters are the most satisfactory filtration medium for railroad water treating plants. The excelsior filter is simple in construction, requires little attention and is the least expensive, both in cost of installation and maintenance.

Railroad water treatment does not require the refinement in filtration that is called for in municipal supply. If the excelsior is carefully selected, having been made from one of the soft white woods, such as basswood, poplar or cotton wood, it makes an effective filtration medium. Care should be exercised in placing the excelsior, avoiding lumps, and the filter should be of ample thickness.

If the water is properly treated so that it clarifies readily and the precipitate settles out freely, the excelsior filter will remove any material that may be carried to the top of the softener and will give a clear, satisfactory water. The filter should be sufficiently large so that the rate of flow through the filter is not excessive and the material should be renewed at proper intervals. We have some softeners that run a year between renewals while others have to be changed out as often as every six months. In all of our later plants, the machines are so designed that they will run at least eight months between renewals.

Excelsior Is a Back Number

By WATER ENGINEER

Experience with the use of excelsior for clarifying water in treating plants leaves more to be said in opposition than in support of it. It was a common practice to use this material in early attempts at water treatment on the railroads in this country, a bed or mattress of excelsior usually being installed near the

top of the settling tank so that the water, in flowing upward, would pass through this material on its way to the discharging end of the system. The theory was that the excelsior would remove the particles of precipitates in the water that failed to settle out naturally before reaching this bed.

There is no question but that these excelsior beds do catch quantities of material and they are in use in a number of treating plants at the present time, but the advocates of this practice are not as numerous as they once were. Excelsior filters have been removed from many treating plants which were equipped with them when built and in a number of other old plants excelsior filters are retained only to avoid controversies with operating officers and enginemen who foster the idea that such beds are essential parts of the system and who would rebel upon learning of their removal.

The trouble with excelsior is that where the settling conditions are so poor in a treating plant as to advise or necessitate the use of some mechanical filtering device the excelsior loses its efficiency rapidly and soon chokes up. In such cases if the renewal of the excelsior is not made promptly (and all renewals cost money), the conditions are apt to become worse than if excelsior was not used in the first place. The interesting discovery which has been made in connection with excelsior filters, is the frequency with which much material is found on the top of the filter; an observation which demonstrates how imperfect a filtering medium excelsior is. A plausible explanation of the presence of this material on the top of the excelsior bed is that the excelsior in the cross section of the settling basin so constricts the cross sectional area that the velocity of flow is increased above the settling rate until the water passes through the excelsior and reaches the quieter zone above. While there probably are still places and plants where excelsior, under careful supervision, is a help in treating the water the better solution of an unsettled treated water condition is to improve the design of the treating plant or the process of chemical action so that such turbidity can be avoided. The point is not that excelsior is out of date but that it has been weighed in the balance and found wanting.

Camber for Pipe Culverts

In installing new pipe culverts how should the camber be varied to compensate for the height of the fill and also for the bearing powers of different soil foundations?

The Camber Used Varies with Conditions

By E. L. Crugar

Engineer of Construction, Illinois Central, Chicago

Some railroads follow the practice of installing long pipe culverts with camber to allow for settlement of the pipe due to the weight of the embankment. The amount of camber required depends entirely upon the nature and condition of the soil and also the height of the embankment. It is largely a matter of judgment on the part of the man installing the pipe and in some cases the pipe does not settle sufficiently to allow it to drain satisfactorily. It would seem that for ordinary installations of concrete or cast iron pipe, it is much better to dig a trench in the natural ground sufficiently deep to embed the pipe, allowing the bell end to be firmly embedded, thereby preventing any slipping of the pipe and consequent unjointing of the various sections, and insuring practically even settlement.

On side hill work where an embankment is to be made, it has been found to be good practice to install the pipe on the upstream half of the fill on about a level grade and the remainder on a minimum gradient which will allow the pipe to be embedded firmly in the natural soil. By this method, if there is any settlement the level portion will settle first and if none occurs, the pipe will still afford a clear waterway.

The Camber Used Is a Matter of Judgment

By George W. Rear

Engineer of Bridges, Southern Pacific, San Francisco, Cal.

While we have no specific rule in regard to the cambering of culverts, it is our practice to give them some camber in laying them, the amount of the camber depending on the height of the fill and the nature of the foundation.

We generally try to lay pipe culverts with a considerable grade, especially if they are placed in embankments of any considerable height. Taking an embankment 15 ft. high as an illustration, we would not allow any camber if the foundation was on rock, but would allow some camber for other foundation materials with a maximum of about four inches if the material was ordinary soil. Camber for culverts of other depths would be in proportion. We do not recommend pipe culverts for very soft foundations.

Inspection of Rail Ends When Removing Angle Bars

To what extent should rail ends be inspected for incipient bolt hole or end breaks when the angle bars are removed for renewal or other purposes?

Inspection of Rail Ends Should Be Made Whenever the Angle Bars Are Removed

By H. R. Clarke

General Inspector Permanent Way, Chicago, Burlington & Quincy, Chicago

The failure of a rail due to several inches of the ball breaking out at the end is one of the common types of failures. When a failure of this kind occurs, it is usually found that there has been an old crack, generally through the bolt holes, for some time. For this reason rail ends should be carefully inspected for such cracks whenever the angle bars are removed for any reason.

A careful examination is particularly necessary when the worn angle bars are being replaced with new ones. Under traffic the rail and the original bars have become adjusted to a certain set of strains and stresses applied in certain directions. While this condition remains undisturbed, the rail will probably stand up under traffic for some time. The application of new bars results generally in a lifting or raising of the rail ends and creates stresses different from those that were in existence while the old bars were in use.

The new bars, being full section, fill the fishing space of the rail in a way that the worn bars did not, making it possible in the tightening of the bolts to exert a pressure of a wedging nature under the ball of the rail that perhaps was not possible with the old worn bars. The result of this is a tendency to develop to the point of failure any weakness or incipient cracks that might be in the rail ends.

A careful inspection usually enables a trackman to find any cracks and as it is easily made, it should not be neglected. If the rail ends under the angle bars

have become rusted and corroded, they should be cleaned off with a stiff broom or brush, a wire brush being used if necessary. This should be done to remove thoroughly the accumulation of rust so that any existing cracks may be seen, and also to permit a tight and proper fit of the new bars when applied. The rail ends should be oiled before the new bars are applied so as to keep the bars from rusting to the rail in such a way as to prevent expansion and contraction, the same as is done when new rail is being laid. It is, of course, necessary to clean the ends of rails thoroughly before the oil is applied.

No Special Inspection Except for Rail to Be Relaid

By L. H. Bond

Engineer Maintenance of Way, Illinois Central, Chicago

It is our practice to classify relieved rail into four classes: That which is to be relaid in main tracks after the ends are sawed off; that which can be relaid in main tracks without sawing; rail for sidings and yard tracks; and scrap.

When the ends are sawed, all chance of the rail having defective ends is eliminated, and in addition this method of reclamation provides new fishing, new drilling and square ends. To determine if the rail can be laid without sawing a thorough examination is made of the ends to discover any visible defects. The rail to be used for sidings and yard tracks does not require the same minute inspection as is given to rail for main tracks, while rail that is not fit for yard tracks is classified to scrap.

Sawing off the rail ends greatly prolongs the usefulness of the rail and relieves all chances of end failure which might have developed under the original angle bars. No inspection is made other than by ordinary observation.

Rendering Wooden Shingles Fire Resistant

Can wooden shingles be made fire resistant economically?

Fire Resistant Wooden Shingles Are Highly Economical

By J. Schofield

Architect, Canadian National Railways, Montreal, Que.

Wooden shingles laid without previously being dipped have a tendency to cup, and thus produce a fire hazard. I believe that wooden shingles of good quality, dipped in a fire-resisting compound before being applied to the roof rank next after slate, tile or asbestos shingles in freedom from fire hazard, and that they return the highest percentage of value for the money expended.

Wooden Shingles Can Be Made Reasonably Fire Resistant

By Master Carpenter

Wooden shingles, which were almost universally used in the early days of the American railroad, have been largely replaced with other types of roof coverings. One of the principal objections to wooden shingles is the fire hazard, which increases rapidly with the age of the roof. There are many places where they are still used for railroad buildings because of their moderate cost, light weight and low conductivity of heat. On this account any method of making them fire resistant at small cost will result in economy, since railroad buildings are especially exposed to the danger of fire caused by sparks from locomotives.

There are a number of fire-resisting paints and compounds on the market which will render wooden shingles resistant to the ordinary sources of fire from without, and shingles dipped in these paints or compounds before being laid will afford reasonable protection to the building. Dipping the shingles is preferred to painting them after the roof is laid since it tends to prevent curling which adds to the fire hazard. After being laid they should be painted with a fire-resisting paint at intervals of about five years.

Avoiding Irritation of the Skin in Handling Creosoted Ties

What precautions can be taken to avoid irritation of the skin when handling creosoted ties and what remedies will relieve this irritation?

Some Simple and Effective Precautions

By L. H. Harper

Superintendent Creosote Plant, Central of Georgia, Macon, Ga.

The handling of creosoted ties in hot weather will be more apt to irritate the skin than in cold weather and, naturally, some skins are more easily affected than others. Rubbing a little lubricating oil or grease on the hands and arms in advance is a good precaution. The hands should be kept away from the face and eyes, and should be thoroughly washed with warm water and soap or washing powder after finishing work. If the skin is very sensitive and becomes irritated, an application of oil or grease will soothe it.

Goggles are the best precaution against creosote splashing into the eyes, but in case some of it does get in, a drop or two of boric acid solution applied with an eye dropper will generally ease the pain and prevent any spread of the irritation.

After an experience of seven years with creosote and creosoted materials I have yet to see the first case of permanent injury resulting from contact with creosote. By using the simple precautions mentioned above even the temporary discomfort can be avoided.

Precautions to Be Followed

By J. D. Keiley

Supervisor, Chesapeake & Ohio, Russell, Ky.

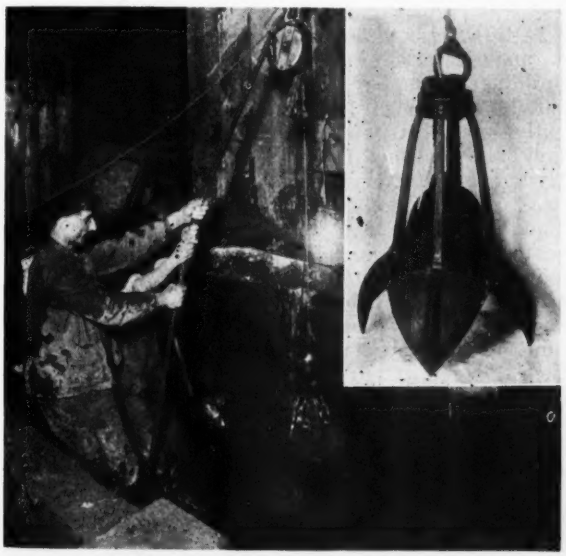
In handling creosoted ties the following precautions should be taken: The men should be fully clothed, that is, they should never be allowed to unload creosoted ties from cars with bare arms, etc., but should wear regulation denim jackets; they should wear gloves; they should grease their faces, practically any kind of grease will answer the purpose; there should be sufficient help in unloading the ties so that no chances will be taken in the men slipping on account of handling more weight than they should.

In applying creosoted ties to the track the men should never be allowed to use picks to drag them under the rail or, for that matter, for any handling. Tie tongs should always be used. When ties are hit with picks small particles of creosote fly into the air which are extremely dangerous to the eyes of the men working in the vicinity.

It is interesting to note that a foreman who has handled creosoted ties for the last ten years, using both colored and white men, states that he has had many white men affected by the creosote, but in no case has he ever had a colored man injured due to the creosote.

Dwarf Orange Peel Bucket Proves Useful

A TINY but faithful reproduction of an orange peel bucket has been placed on the market by the Hayward Company, New York, under the name Hayward dwarf orange peel bucket, for the purpose of providing a digging tool adapted to certain special classes of excavation work. One use for which it is particularly adapted is to remove the materials from pipes or tubes that are being driven for wells, small cylinder piers,



The Dwarf Hayward Bucket and the Manner of its Use

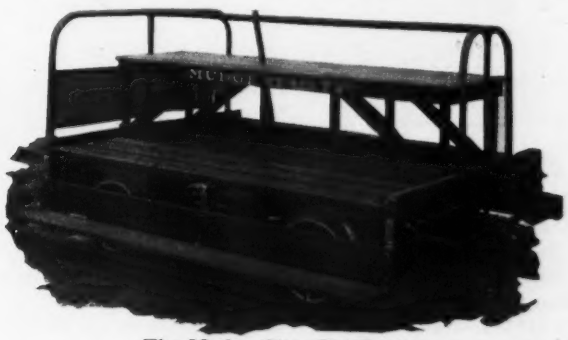
etc. As the maximum spread of the smallest model of this bucket is only 11½ in., it is possible to use it inside a 12-in. pipe.

This bucket is operated with holding and closing lines exactly like the larger models. The bucket is held in the open position by lowering it with the holding line until it reaches the material to be removed. The holding line is then slacked off and tension taken on the closing line until the bucket is filled. It is hoisted by continuing the pull on the closing line and then dumped by slacking the closing line and holding the holding line.

These buckets are available in five sizes with capacities ranging from 100 cu. in. to 1 cu. ft. and with maximum spreads in the open position ranging from 11½ in. to 2 ft. 2 in. They are said to be adaptable to use in all materials from soft earth to compact sand, clays or gravels. As used in soft materials the weight of these buckets ranges from 35 lb. for the smallest size to 210 lb. for the largest but when used in hard materials a driving weight is added which increases the weight of the smallest model to 65 lb. and that of the largest to 330 lb. The smaller sizes are readily operated by hand but better and quicker work can be done by using a small power hoist. The application of these machines to various purposes is said to have been sufficiently broad to have demonstrated their adaptability to a wide variety of uses where work must be done in cramped or restricted quarters.

A New Trailer for Large Gangs

MUDGE & CO., Chicago, has introduced a new type of trailer car known as the Mudge Class T-2, which is designed primarily to handle large gangs. The frame is constructed of selected kiln dried maple and oak timbers. It is braced on each end and in the middle with 1½-in. by 1½ in. by ¼ in. formed angle



The Mudge Class T-2 Trailer

irons, providing an extra support for both the frame and foot boards. In addition, the drawbar pull is distributed over all four cross sills by means of five tie rods extending the full length of the car. This eliminates undue strain on either of the end sills. The end sill strain is further minimized by the use of the Mudge spring drawbar, which is standard equipment on both ends of this trailer car. The seat top is so constructed

as to permit ample room under it for personal belongings such as dinner buckets, coats, etc.

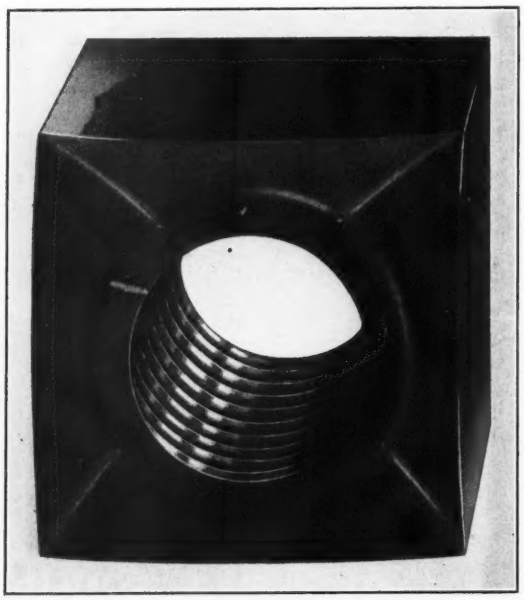
The car is equipped with the Mudge-Bower axle bearings which were described in *Railway Engineering and Maintenance* for December, 1926, page 519. The axles are $1\frac{7}{16}$ in. in diameter.

The brakes are of the four-wheel type and are operated by a vertical brake lever located in the center of the car out of the way of all passengers and still accessible from any part of the car.

A Lock Nut with a New Thread Form

THE Graham Bolt & Nut Company, Pittsburgh, Pa., has recently begun the production of a lock nut with a self-locking form of thread, known as the "Selflock." This thread is a mechanical and scientific development of screw threads to produce a locking element in nuts that can be used in conjunction with bolts having U. S. Standard threads. In developing this type of thread as many of the characteristics of the U. S. S. thread were maintained as possible, resulting in a thread having the following details in common with the U. S. S. thread: Equal areas, true U. S. S. lead, location of pitch line and U. S. S. flats.

One of the illustrations shows a comparison of the Selflock thread with the U. S. S. from which it is



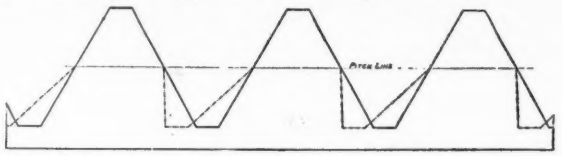
The Star Crown Has Been Adopted as a Means of Identifying Selflock Nuts

seen that the pitch line location is the same and that the thread form inside the pitch line is identically the same as the U. S. S. while outside the pitch line the thread angles are changed slightly.

In the design of this lock nut there is no distortion of the thread, the lead being true U. S. S. and the helix angle constant. Owing to the equal thread areas, no material is removed when Selflock nuts are applied on U. S. S. threaded bolts. As the lead is true U. S. S. the nut may be applied from either face, the holding power developed being the same in either case.

When Selflock nuts are applied, that part of the thread on the bolt lying outside the pitch line is tipped slightly, so as to create a definite frictional lock on every thread engaged by the nut. On account of the bond that is created between the thread on the bolt and the Selflock thread in the nut, it is said to stay in place. If it should be necessary to remove the nut it will require more of a wrench load to break the contact and start the nut off the bolt than was required to put it on. The Selflock nut is applied in the usual manner—started with the fingers and wrenched to position.

U. S. S. nuts may be applied to bolts that have had Selflock nuts on them. Likewise Selflock nuts may be applied many times to the same bolt thread. If this should be done so many times that a sufficient lock is not developed, the nut can be reversed, after which the locking feature will again function.

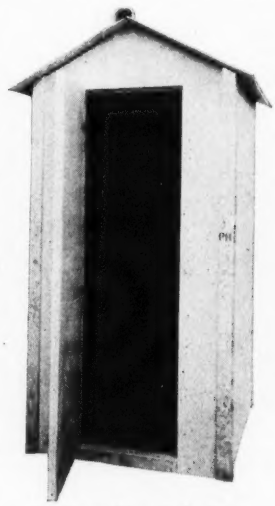


The Selflock Thread Compared With U. S. Standard Thread

The Graham Bolt & Nut Company has been experimenting with this type of lock nuts for some time and actual service tests on frog and crossing bolts, track bolts and similar installations where severe vibratory conditions prevail, are said to have demonstrated the ability of this type of thread to resist the loosening effect of vibration.

A Portable Telephone Booth of Asbestos

PORTABLE telephone booths are now being manufactured of asbestos lumber by the Asbestos Buildings Company, Philadelphia, Pa., for use at passing sidings and other outlying points, where they are reported to be giving satisfactory results. The booths are made from Ambler asbestos lumber which is manufactured from long fibre Canadian asbestos and Portland cement, built up into sheets and then subjected to hydraulic pressure. The sides are assembled by setting in specially designed and patented corner connectors of galvanized metal. The door has extra heavy galvanized brass pin hinges which are bolted on, and a galvanized safety hinge clasp is provided for the padlock. The floor is of tongue and groove pine.



A Portable Asbestos Telephone Booth

The booths are shipped in knock-down form and, owing to their simplicity and the lightness of the material, may be erected by ordinary labor without the use of a work train or derrick. The asbestos lumber, besides being fireproof, is said not to deteriorate from exposure to the weather, and this together with the fact that painting is not required, reduces maintenance costs to a minimum and assures a neat appearance during a long service life.

With the Associations

The Wood Preservers' Association

The program for the twenty-third annual convention which will be held at the Hermitage hotel, Nashville, Tenn., on January 25-27, is as follows:

Tuesday Morning

Opening business.

Tuesday Afternoon.

Report of Committee on Preservatives.

Paper on Some Experiments on the Toxity of Inorganic Salts, by E. Bateman, chemist in forest products, Forest Products Laboratory, Madison, Wis.

Report of Committee on the Treatment of Car Lumber.

Report of Committee on the Treatment of Fir Lumber.

Paper on The Relation of Temperature and Pressure to Penetration of Cresote into Wood, by J. D. MacLean, engineer in forest products, Forest Products Laboratory, Madison, Wis.

When Is Rot Not Rot?, by W. H. Long.

Wednesday Morning

Report of Committee on Retailing Treated Forest Products.

Paper on The Factors Governing the Permanence of Preservatives, by E. Bateman, chemist in forest products, Forest Products Laboratory, Madison, Wis.

Report of Committee on Lumber "Trunking and Capping."

Address by W. H. Courtenay, chief engineer, Louisville & Nashville, Louisville, Ky.

Observations on Wood Preservation in Europe, by George M. Hunt, in charge of wood preservation, Forest Products Laboratory, Madison, Wis.

Report of the Service Bureau Board.

Thursday Morning

Report of Committee on Material Handling.

Report of Committee on Tie Service Records.

Report of Committee on the Non-Pressure Treatment of Poles.

Report of Committee on Pole Service Records.

Report of Committee on Post Service Records.

Report of Committee on Steam Treatments.

Closing Business.

Arrangements have been made for accommodations on Pennsylvania trains for those leaving New York on Sunday morning and Chicago on Sunday evening, and arriving at Louisville early Monday morning where a portion of the day will be spent inspecting treating plants at that point, after which the party will proceed to Nashville by special train late Monday afternoon.

The Tie Producers Association

The National Association of Railroad Tie Producers will hold its ninth annual convention at the Hermitage Hotel, Nashville, Tenn., on January 27-28. The program is as follows:

Thursday Afternoon, January 27

Address of president and reports of officers and committees.

Report on General Conditions in the Tie Industry by officers from various districts.

Thursday Evening

Annual dinner.

Friday Morning, January 28

Paper on Tie Production Costs, by G. C. Graeter, timber engineer, Western Tie & Timber Company, St. Louis, Mo.

Paper on Philosophical Engineering and Cross Ties, by O. H. L. Wernicke, president, Pine Institute of America, Inc., Gull Point, Fla.

Paper on General Business Conditions, by Archer Wall Douglas, vice-president, Winchester-Simmons Co., St. Louis, Mo.

Friday Afternoon

Paper on The Tie Producers' Part in the Consumers' Problems, by J. B. Hill, president, Nashville, Chattanooga & St. Louis, Nashville, Tenn.

Paper on Future Sources of Cross Tie Supply, by E. A. Sterling, eastern manager, James D. Lacey & Co., New York City.

Closing business.

Adjournment.

The Engineering Association

The committee on arrangements has selected the new Palmer House, Chicago, as the headquarters for the convention which will be held on March 8-10. The technical sessions will be held in the Red Lacquer room, while the annual dinner on Wednesday evening, March 9, will be held in the grand ball room which has a seating capacity for more than 1,000 persons. The Signal Section, A. R. A., will also hold its annual meeting in the same hotel on March 7-8. The work of the committees of the engineering association is progressing rapidly, 16 reports already having been completed, while 5 more will be issued in a bulletin in about a week.

Coincident with the convention of the American Railway Engineering Association, the National Railway Appliances Association will present its annual exhibit of railway appliances at the Coliseum, opening on Monday morning, March 7, and closing on Thursday evening, March 10.

The nominating committee has presented the following names as candidates for offices for the ensuing year:

President, D. J. Brumley, chief engineer, Chicago terminal improvements, Illinois Central, Chicago.

Vice-president (one to be elected), W. P. Wiltsee, chief engineer, Norfolk & Western, Roanoke, Va., and Louis Yager, assistant chief engineer, Northern Pacific, St. Paul, Minn.

Secretary, E. H. Fritch.

Treasurer, George H. Bremner.

Directors (three to be elected), W. J. Backes, engineer maintenance of way, Boston & Maine, Boston, Mass.; F. R. Laying, asst. chief engr., Bessemer & Lake Erie, Greenville, Pa.; J. deN. Macomb, office engineer, Atchison, Topeka & Santa Fe, Chicago; A. Montzheimer, chief engineer, Elgin, Joliet & Eastern, Joliet, Ill.; J. V. Neubert, engineer maintenance of way, New York Central, New York City; W. M. Post, assistant to chief signal engineer, Pennsylvania, Philadelphia, Pa.; O. E. Selby, principal assistant engineer, Cleveland, Cincinnati, Chicago & St. Louis, Cincinnati, Ohio; C. H. Stein, assistant to president, Central Railroad of New Jersey, New York City; Dr. Hermann von Schrenk, consulting timber engineer, New York Central, St. Louis, Mo.

Members of nominating committee (five to be elected), J. E. Armstrong, assistant engineer, Canadian Pacific, Montreal, Que.; W. J. Burton, assistant valuation engineer, Missouri Pacific, St. Louis, Mo.; W. A. Clark, assistant to general manager and chief engineer, Duluth & Iron Range, Duluth, Minn.; O. F. Dalstrom, engineer bridges, Chicago & North Western, Chicago; W. T. Dorrance, designing engineer, New York, New Haven & Hartford, New Haven, Conn.; H. E. Hale, vice-chairman, Presidents' Conference Committee, New York City; C. R. Knowles, superintendent water service, Illinois Central, Chicago; C. M. McVay, division engineer, New York Central, Charleston, W. Va.; Frank Ringer, chief engineer, Missouri-Kansas-Texas, St. Louis, Mo., and S. T. Wagner, consulting engineer, Reading, Philadelphia, Pa.

Ballots will be issued to the members about February 1.

The Material Market

IT HAS become almost trite to say that the railroads constituted the leading influence in the market for iron and steel during the current month. This is true nevertheless. In October and November rail orders were the predominating factor, while in December it was orders for cars. Contracts for more than 5,000 cars were noted in the *Railway Age* during the month of December, besides inquiries for a large number of cars in addition, for which orders for over 3,000 have been placed since January 1.

That rail buying is not entirely concluded is indicated by the fact that orders totalling approximately 18,000 tons were placed with Chicago mills by three or four roads and several frog and switch manufacturers, and that a check-up shows a few roads with orders still unplaced. Chicago rail mills operated at about 75 per cent of capacity during December but are expected to increase the rate of rolling because of the pressure for deliveries during January, an evidence of the increasing tendency to start rail laying earlier in the year.

The demand for track fastenings continues active, although only a limited number of actual orders were reported during December. Of these, however, one was so large as to produce a marked effect on the totals for the month. The New York Central ordered 2,500,000 tie plates, 152,700 angle bars and 200,000 kegs of spikes. The Pennsylvania, which has not placed orders for its needs, has issued inquiries for 1,000,000 tie plates, 175,000 angle bars, 4,500,000 lb. of spikes and 830,000 track bolts.

Prices for iron and steel materials, as shown in the table below, have been subject to change in but one item, namely, cast iron pipe, with respect to which there was a slight reduction. Furthermore, the current prices are so firm in nearly every item that little change is anticipated in the near future.

Prices Per 100 lb.

	November		December	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	$2.80 to $3.00	$2.90	$2.80 to $3.00	$2.90
Track bolts	3.90 to 4.25	3.90	3.90 to 4.25	3.90
Angle bars	2.75	2.75	2.75	2.75
Tie plates, steel	2.25 to 2.35	2.35	2.35	2.35
Boat spikes	3.25	3.25	3.25	3.25
Plain wire	2.50	2.55	2.50	2.55
Wire nails, keg	2.65	2.70	2.65	2.70
Barb wire, galv.	3.35	3.40	3.35	3.40
C. I. pipe, 6 in. 12 in., ton		47.20 to 48.20		46.20 to 47.20
Plates	1.90	2.10	1.90	2.10
Shapes	2.00	2.10	2.00	2.10
Bars, soft steel	2.00	2.10	2.00	2.10
Rivets, struc.	2.45 to 2.60	2.60 to 2.75	2.40 to 2.60	2.60 to 2.75
Conc. bars, billet	2.00 to 2.10		2.00 to 2.10	
Conc. bars, rail	1.80 to 1.90	2.00	1.80 to 1.90	1.90 to 2.00
Rails, per gross ton, f.o.b., bills		43.00		43.00

Taking advantage of the healthy tone of the scrap market, a number of railroads are offering considerable tonnages of old material, notably at St. Louis and Chicago. The table below shows that prices have been practically stationary for the last month.

Per Gross Ton

	November	December
Relaying rails	$26.00 to $31.00	$26.00 to $31.00
Rails for rerolling	16.50 to 17.00	16.00 to 16.50
Rails less than 3 ft. long	16.25 to 16.75	16.25 to 16.75
Frogs and switches cut apart	14.50 to 15.00	14.50 to 15.00
Steel angle bars	15.00 to 15.50	15.00 to 15.50

Average orders on hand December 24, 1926, per mill in the Southern pine field amounted to 1,627,127 ft. b.m., representing a decline from 2,080,830 ft. b.m. on October 1. This condition is in sharp contrast with that prevailing in the late months of both 1925 and 1924, for in 1925 the orders on hand during the last three months were in almost uniform volume at a figure in excess of 2,000,000 ft. b.m., while in 1924 there was an increase from 1,728,000 ft. b.m. early in October to 2,071,000 ft. b.m. late in December. This is explained by the disparity in orders received during the last three months of 1926 as compared with the corresponding period of the two earlier years. The average volume of orders per mill received during the last three months of these years totaled 5,900,000 ft. b.m. in 1926, 7,255,000 in 1925, and 7,824,000 in 1924.

While corresponding information has not been available concerning the west coast mills, it is clear that the conditions are not widely different since it is planned to suspend production on almost a 100 per cent basis for a period of at least 60 days. Reports from the west coast show that an inquiry for 40,000,000 ft. b.m. of lumber for cars and railway maintenance material has been one of the most prominent features of the market in recent weeks.

Prices for Southern pine have experienced a moderate decline during the month, while those for Douglas fir have indicated no change, it having been the contention of the west coast manufacturers that their prices have long been on a bare level of the cost of production.

Southern Pine Mill Prices

	November	December
Flooring, 1x4, B and B flat	$45.15	$44.59
Boards, 1x8, No. 1	37.94	35.88
Dimension, 2x4, 16, No. 1, common	27.96	26.35
Dimension, 2x10, No. 1, common	32.36	28.00
Timbers, 4x4 to 8x8, No. 1	23.50	21.57
Timbers, 3x12 to 12x12, rough	.....	.....

Douglas Fir Mill Prices

Flooring, 1x4, No. 2, clear flat	$27.00	$27.00
Boards, 1x8, 6 to 20, No. 1, common	16.00	16.00
Dimension, 2x4, No. 1, common	17.00	17.00
Dimension, 2x10, 16, No. 1, common	17.00	17.00
Timbers, 6x6 to 8x8, No. 1	20.00	20.00
Timbers, 3x12 to 12x12, rough	18.00	18.00

Prices for Portland cement at the distributing points listed below, are the same as those given in last month's issue with the exception of that for Minneapolis which has been cut 10 cents.

New York	$2.15	Minneapolis	$2.22
Pittsburgh	2.09	Denver	2.85
New Orleans	2.30	Dallas	2.05
Chicago	2.10	San Francisco	2.31
Cincinnati	2.37	Montreal	1.15

An Orderly Storage of Motor Car Parts at Barboursville, W. Va., on the Chesapeake & Ohio

Railway News Briefly Told

The Missouri Pacific has presented a locomotive to the Agricultural and Mechanical College of Texas for use in the engineering department of that institution. The locomotive is No. 110, of the International Great Northern, and was built in 1890.

The movement of lettuce from California eastward this year will amount to 27,000 car loads, or three times the amount handled in 1922. Of this total about 60 per cent will come from the Imperial Valley.

The Chicago, Springfield & St. Louis, which has taken over that part of the former Chicago, Peoria & St. Louis between Springfield, Ill., and Lock Haven, resumed freight service on December 10, and on December 20, inaugurated passenger service between Springfield and Alton.

The suggestion that the rights-of-way of railroads and the lands in public highways not occupied by the roadway be used as pasturage for bees, has been made by Dr. L. H. Pammel, chairman of the Iowa Board of Conservation. He recommends planting native flowers and shrubs such as the wild plum, red haw, Washington thorn, choke cherry and elderberry. The Chicago & North Western and the Wabash are said to be among the railroads supporting the plan.

At Williamsport, Pa., and at certain other places on the Central Pennsylvania division of the Pennsylvania, the station platforms were cleared of a heavy fall of snow on December 5 by the use of ditchers, which effected a large saving in the use of laborers. Fifteen locomotives on that division have been equipped with snow blowers and were used during the same storm to clean switches and for other similar work, resulting in a large saving of manual labor.

A special train consisting of nine baggage cars loaded with silk left Seattle, Wash., at 6:00 p. m. on November 19, and arrived in New York at 6:41 a. m. on November 23, having made the run in 81 hr., 41 min., and averaging 38.06 miles an hour, including stops and transfers. The train was routed over the Great Northern to St. Paul; over the Chicago Great Western from St. Paul to Chicago; over the Wabash from Chicago to Buffalo; and over the Delaware, Lackawanna & Western from Buffalo to New York. The average rate of speed is said to be a record for the route traversed.

A number of Japanese railway officers are now in this country and Canada, where they will study American railway methods for six months. K. Hashima, of the engineering staff of the Hokkaido Railways, will make his headquarters at Winnipeg, Man., to study the snow fighting methods and equipment used by the Canadian National. G. Kurata, construction engineer of the government railways, will make a study of construction methods in the United States and K. Hagimura, assistant chief engineer in the architectural division, will devote his attention to railway buildings.

Four employees of the Pennsylvania have been awarded prizes of $50 each for plans to provide for the organization of the "New Ideas Bureau" which that company contemplates establishing for the purpose of improving its service. The prize winners were Charles Weiss, assistant supervisor, Philadelphia Terminal division; Samuel L. Sanderson, track laborer, Pittsburgh division; R. C. Keene, signalman, St. Louis division; and R. M. Nolan, clerk in the office of the works manager, Altoona, Pa. A total of 278 plans was submitted and 16 other employees, in a variety of positions, were awarded honorable mention.

The Alaska Railroad, which is owned by the government, closed the fiscal year ending June 30, 1926, with an operating deficit of $1,017,860, including its water lines, according to the annual report of the governor of Alaska to the Secretary of the Interior. This deficit was $557,289, or 35.4 per cent smaller than for the previous year, the reduction being due to an increase in revenue from all sources of 23.2 per cent, while expenses were reduced 14.2 per cent. The total deficit for the year, including charges to capital account, was $1,690,751, a decrease of 18.3 per cent.

I. B. Tigrett, president of Gulf, Mobile & Northern, has issued an appeal to all citizens and especially to officers of the law, to do everything possible to precent accidents at highway grade crossings, citing a recent check of automobiles crossing the main line at a town in Mississippi, where out of 611 motor vehicles crossing the track only 1 came to a full stop before crossing, and 3 others slowed up and apparently looked for approaching trains, while the other 607 crossed without slacking speed.

President Coolidge, in his message to Congress on December 7, said: "One of the large contributing causes to the present highly satisfactory state of our economic condition is the prompt and dependable service, surpassing all previous records, rendered by the railroads." The President recommended that the process of valuing railroads be simplified, that the primary valuations be completed as rapidly as possible and that legislation providing a more effective method for promoting railroad consolidations be enacted.

The Union Pacific System has been awarded the E. H. Harriman gold medal for the most conspicuous accident prevention work in America during 1925, thus winning the medal for the second consecutive year. The Duluth, Missabe & Northern was awarded the silver replica of the medal for having done the best safety work among railroads with between 1,000,000 and 10,000,000 locomotive miles during the year, and the Green Bay & Western was awarded the bronze replica of the medal for the most successful accident prevention work among roads operating less than 1,000,000 locomotive miles during the year. On the Union Pacific no passengers were killed during the year, while on the Duluth, Missabe & Northern and the Green Bay & Western there were no fatal accidents to either passengers or employees.

The surgical department of the Central of Georgia might be more accurately designated as the Department of Health and Physical Welfare, according to J. J. Pelley, president of that road. As a result of a campaign carried on by the surgical department under the direction of Dr. Craig Barrow, chief surgeon, waste land has been reclaimed and drainage improved since 1919, resulting in a measurable control of malaria. The records of 23 track gangs on the Southwestern division show that 503 days' time were lost by malaria in 1919, against but 83 days for the same gangs in 1921, while in the bridge and building gangs on the same division the loss of 605 days' time by malaria in 1919 was reduced to 21 days in 1922. The successful warfare against mosquitoes has encouraged many communities to follow the road's example in draining and oiling. The road also deals actively with typhoid and hookworm, furnishing innoculation free to its employees.

Personal Mention

General

R. E. Cahill, division engineer of the Northern division of the Missouri Pacific, with headquarters at Atchison, Kan., has been promoted to acting superintendent of the same division, with the same headquarters.

G. H. Warfel, general roadmaster on the Union Pacific, with headquarters at Omaha, Neb., has been promoted to acting assistant to the general manager, with the same headquarters, and will have supervision over all safety work and matters pertaining thereto, in the place of **W. L. Richards,** who has been granted a leave of absence on account of illness.

H. M. Lull, formerly chief engineer of the Texas and Louisiana Lines of the Southern Pacific, and more recently assistant to the president, has been promoted to executive vice-president and will have substantially the same authority and duties as the late president, **W. R. Scott,** who died on December 20. A sketch of Mr. Lull's career was published in the November issue of *Railway Engineering and Maintenance* at the time of his promotion to the position of assistant to the president.

Arthur B. Gloster, roadmaster on the Cumberland Valley division of the Louisville & Nashville, with headquarters at Middlesboro, Ky., has been promoted to superintendent of the same division, with the same headquarters, succeeding **O. B. Hollingsworth,** deceased. Mr. Gloster was born at LaGrange, Tenn., and graduated from the University of Tennessee in 1898, just prior to his enlistment for service in the Spanish-American war. After his discharge from army service in 1899 he entered the employ of the Louisville & Nashville in the construction department on the Alabama & Florida division, where he remained until 1907, when he was promoted to assistant engineer on the Cumberland Valley division. He was promoted to roadmaster of the Atlanta division on January 1, 1914, and in 1918 was transferred to the Cumberland Valley division, with headquarters at Middlesboro, where he was located at the time of his recent promotion to superintendent.

Engineering

H. E. Perkins has been appointed assistant division engineer on the Baltimore & Ohio, with headquarters at Wheeling, W. Va., succeeding **Guy Long,** whose promotion to district bridge inspector is noted elsewhere in this issue.

Gordon R. West has been appointed engineer of reclamation of the Missouri Pacific, with headquarters at St. Louis, Mo., and will handle reclamation and development projects involving problems of drainage and irrigation.

Edward E. Stetson, principal assistant engineer of the Chicago Union Station Company, has been appointed assistant to the chief engineer maintenance of way of the Western region of the Pennsylvania, with headquarters at Chicago.

R. A. Stephens, instrumentman in the division engineer's office of the St. Louis-San Francisco at Sapulpa, Okla., has been promoted to resident engineer on the new line from Aberdeen, Miss., to Kimbrough, Ala., with headquarters at Columbus, Miss.

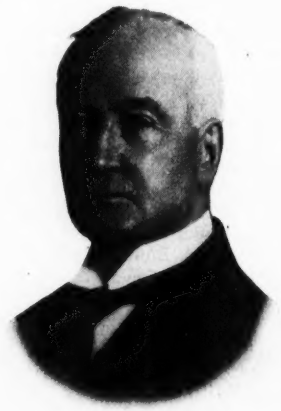
E. D. Wallace, track supervisor on the Kentucky division of the Louisville & Nashville, has been promoted to assistant engineer, with headquarters at Louisville, Ky., to succeed **A. T. Kinne,** whose promotion to roadmaster is noted elsewhere in this issue.

Frank R. Layng, engineer of track on the Bessemer & Lake Erie, with headquarters at Greenville, Pa., has been promoted to assistant chief engineer, and the office of engineer of track has been abolished. He was born on September 9, 1878, at Salem, Ohio, and was educated at the University of Pennsylvania. He entered railway service on October 1, 1897, as a rodman on the Buffalo Allegheny division of the Pennsylvania and was promoted to draftsman on December 1, 1898. He entered the service of the Bessemer & Lake Erie as a draftsman on July 1, 1900, and was promoted to assistant engineer on November 1, 1902. On December 1, 1905, he was promoted to engineer of bridges and on May 1, 1906, to engineer of track, which position he was holding at the time of his recent promotion to assistant chief engineer.

George A. Kirley, signal engineer and superintendent of telegraph on the Boston & Albany, with headquarters at Boston, Mass., has been promoted to chief engineer with the same headquarters, succeeding **F. B. Freeman,** who has been appointed chief engineer of the New York Central, Buffalo and East. Mr. Kirley was born on August 31, 1880, at Fairfield, Vt., and was educated at the University of Michigan, graduating in 1907, and entering railway service the same year as a draftsman in the signal department of the New York Central at New York. In May, 1909, he went to the Boston & Albany, and since that time has been in the continuous service of the signal department of that road, being promoted to draftsman, chief draftsman and assistant engineer, until his promotion to signal engineer in 1918, which position he was holding at the time of his recent promotion to chief engineer.

George A. Kirley

F. B. Freeman, chief engineer of the Boston & Albany since 1909, has been appointed chief engineer of the New York Central, Buffalo and east, with headquarters at New York, succeeding **George W. Kittredge,** retired. Mr. Freeman was born on April 2, 1867, at Dublin, Ireland, and was educated at the Rathmines school and the Royal College of Science, Ireland. He entered railroad service on January 1, 1886, as a mechanical apprentice in the Inchecora shops of the Great Southern Railway of Ireland, from which, in 1887, he went to the Horwich shops and the Lancashire & Yorkshire Railway of England. From 1887 to 1889 he again attended the Royal College of Science, Ireland, after which, to 1890, he was construction engineer of the Loughrea & Ahymon Railway of Ireland. In 1890 he was made construction assistant engineer of the Ballinrobe & Claremorris Railway from which time he held the following positions: 1890-91, survey assistant engineer of the Westport & Mulraney Railway; 1891, construction sub-agent of the Claremorris & Collooney Railway; 1891-92, construction sub-agent of the Westport & Mulraney Railway; in 1892 he was in charge of legal work in connection with right-of-way for the Newmarket & Kanturk Railway and the Tarlee & Dinglo Railway of Ireland; 1892-94, assistant engineer in the firm of Kingsley & Brewer, civil engineers at New



F. B. Freeman

York; in 1894 he was connected with the South Orange & Maplewood Street Railway; and from 1894 to 1900, he was an assistant engineer in the bridge department of the Erie. In 1900-01 he became chief draftsman for the New York Central and Hudson River Railroad and was promoted to assistant engineer in charge of design on the same road in 1901 and to assistant engineer of construction on the same road with headquarters at Syracuse, N. Y., in 1902. He left the service of the New York Central in 1902 to become superintendent of construction of the Catawba Power Company, Indiana Hook Shoals, South Carolina, and in 1903, he was associated with H. De B. Parsons, civil engineer, New York, on design, estimates and drafting. He returned to the New York Central and Hudson River Railroad in the same year as assistant engineer of joint facilities and agreements, which position he held until 1905 when he was promoted to designing engineer. In 1907 he was promoted to engineer of construction, and held this position until 1909 when he was appointed chief engineer of the Boston & Albany, with headquarters at Boston, which position he was holding at the time of his recent advancement to chief engineer of the New York Central, Buffalo and east.

George W. Kittredge, chief engineer of the New York Central, Buffalo and east, since April, 1906, has been retired under the pension regulations of that company. He was born December 11, 1856, at North Andover, Mass., and was educated at the Massachusetts Institute of Technology from which he graduated in 1877 to enter private engineering practice on the South Boston flats improvements, Boston, Mass. He entered railroad service in 1880 on the Pittsburgh, Cincinnati & St. Louis. Railway (now a part of the Pennsylvania) in the maintenance of way department, after which time, up to 1890, he was connected with the Pennsylvania Lines West of Pittsburgh. From 1890 to July, 1891, he was engineer maintenance of way and assistant chief engineer of the Cleveland, Cincinnati, Chicago & St. Louis Railway. On July 1, 1891, he was made chief engineer of that road and at the same time chief engineer of the Louisville & Jeffersonville Bridge Company, which positions he held until April, 1906, when he was made chief engineer of the New York Central and Hudson River, now a part of the New York Central. During 1902-03 Mr. Kittredge was president of the American Railway Engineering and Maintenance of Way Association, now the American Railway Engineering Association.

George W. Kittredge

C. A. Whipple, assistant engineer on the Hocking Valley, with headquarters at Columbus, Ohio, has been promoted to district engineer in charge of construction on the new Chesapeake & Hocking line between Gregg and Valley Crossing, Ohio. **C. E. Butler,** assistant engineer, has been promoted to resident engineer, section No. 1 of the new Chesapeake & Hocking line, with headquarters at Reese's Station, Ohio. **C. P. Essman,** assistant engineer, has been promoted to resident engineer, section No. 2, with headquarters at Ashville, Ohio. **E. E. Nelson,** assistant engineer, has been promoted to resident engineer, section No. 3, with headquarters at Circleville, Ohio. **J. S. Stevenson** of the Chesapeake & Ohio drafting force, has been promoted to resident engineer, section No. 4, with headquarters at Circleville, Ohio. **W. H. Eary,** assistant engineer of the Chesapeake & Ohio, with headquarters at Columbus, Ohio, has been promoted to resident engineer, section No. 5, with headquarters at Chillicothe, Ohio. **Enoch J. Jones,** instrument man on the Hocking Valley, has been promoted to resident engineer, section No. 7, with headquarters at Chillicothe, Ohio.

Samuel T. Wagner, chief engineer of the Reading, has retired from active duty and has been appointed consulting engineer. Mr. Wagner was born on August 30, 1861, at Philadelphia, Pa., and graduated from the University of Pennvania in 1881. After leaving college he entered the employ of the Phoenix Iron Company as a draftsman and was promoted successively to inspector, assistant master mechanic and superintendent of shops, during which time he was also resident engineer of erection for a period of about a year on the construction of the Louisville & Jeffersonville bridge over the Ohio river. From 1894 to 1900, Mr. Wagner was assistant engineer in the Bureau of Surveys of the city of Philadelphia and had charge of the Pennsylvania avenue subway and tunnel, and from 1900 to 1902 he was in charge of improvements and filtration of water supplies for the same bureau. He entered railway service on March 1, 1902, as an assistant engineer on the Reading on grade separation work. He was promoted to chief engineer on April 6, 1915, holding that position until the end of 1926, when he retired from active service and was appointed consulting engineer.

Samuel T. Wagner

Clark Dillenbeck, assistant chief engineer of the Reading, has been promoted to chief engineer, following the retirement from active service of **Samuel T. Wagner,** who has been appointed consulting engineer. Mr. Dillenbeck was born on June 24, 1866, at Palatine Bridge, N. Y., and graduated from Cornell University in 1888. He entered railway service in May, 1890, as an assistant engineer on the Reading and was promoted to engineer of bridges and buildings on February 1, 1914. During federal control he was assistant chief engineer of the Reading and the Central Railroad of New Jersey from October 1, 1918, to January 1, 1920. He was assistant chief engineer of the Reading from the latter date until the time of his recent promotion to chief engineer.

Clark Dillenbeck

P. Petri, division engineer on the Baltimore & Ohio, whose promotion to engineer maintenance of way, Eastern lines, was noted in the November issue, entered the service of that road in the construction department on August 4, 1899. After serving in various capacities in the construction and the real estate departments, he was promoted to assistant division engineer on the Chicago division on September 1, 1906. He was promoted to division engineer on January 20, 1907, serving on the Newark, Shenandoah, Ohio River, Connellsville and Cumberland divisions until

September 1, 1915, when he was promoted to district engineer maintenance of way of the Pittsburgh district. On July 15, 1918, he was appointed special engineer in the office of the assistant federal manager, serving in this capacity until the termination of federal control of railways in March, 1920, when he was made division engineer of the Cumberland division, which position he was holding at the time of his recent promotion to engineer maintenance of way, Eastern lines.

T. E. Bliss, assistant engineer on the St. Louis-San Francisco, with headquarters at Ft. Worth, Tex., has been promoted to division engineer, with the same headquarters, to succeed **G. W. Koontz,** who has been transferred to Chaffee, Mo., where he replaces **D. E. Gelwix,** who in turn has been transferred to Ft. Scott, Kan., to succeed **J. A. Reed, Jr.,** who has resigned.

Robert Trimble, chief engineer of the Pennsylvania Company and the Pittsburgh, Cincinnati, Chicago & St. Louis, with headquarters at Pittsburgh, retired on December 31 after a continuous service with the Pennsylvania System of more than 51 years. Mr. Trimble was born at Butler, Pa., and was educated at the Western University of Pennsylvania, now the University of Pittsburgh. He entered railway service in 1875 as a chairman on the Pennsylvania and held various positions in the engineering department including that of principal assistant engineer. In 1903, he was promoted to chief engineer maintenance of way of the Pennsylvania Lines west of Pittsburgh, Northwest system, remaining in this position until July 2, 1918, when he was promoted to chief engineer of construction of the same lines. He was promoted to assistant chief engineer of the Pennsylvania System with direct supervision over lines west of Pittsburgh on March 1, 1920, and was appointed chief engineer of the Pennsylvania Company and the Pittsburgh, Cincinnati, Chicago & St. Louis in July, 1926, in which capacity he was serving at the time of his recent retirement.

Robert Trimble

Russell A. Morrison, whose promotion to assistant division engineer on the Pere Marquette, with headquarters at Grand Rapids, Mich., was noted in the December issue, was born on January 23, 1897, at Alpena, Mich., and was educated at Michigan State College. After leaving high school he was employed from the fall of 1915 to the spring of 1917 on a topographical survey and various construction jobs with the Great Northern Power Company, after which he enlisted in the United States Navy as an ordinary seaman and was released from active service in May, 1919, with the rank of lieutenant, junior grade, in the United States Naval Reserve Forces. After finishing his course at college he entered railway service on June 25, 1923, as an engineering inspector on the Pere Marquette and was promoted to assistant track supervisor on April 15, 1924. He was promoted to track supervisor on August 25, 1924, in which capacity he was serving, with headquarters at Saginaw, Mich., at the time of his recent promotion.

L. F. Rybolt, promoted to assistant division engineer on the Cincinnati, Indianapolis & Western, at Indianapolis, Ind., as noted in the December issue, was born on June 8 1893, at Hamilton, Ohio, and was educated at the Ohio Military Institute at Cincinnati, Ohio. He entered railway service on May 10, 1916, as a rodman on construction on the Baltimore & Ohio, being promoted successively to levelman and transitman and serving in these capacities until March 15, 1920, with the exception of the period from July, 1919, to September of the same year, when he was a draftsman in the maintenance of way department. He left railway service on March 15, 1920, to become connected with the Hamilton Furnace Company at Hamilton, Ohio, on plant maintenance work, where he remained until March, 1921, when he returned to the Baltimore & Ohio as assistant engineer on the corp at Newark, Ohio. He was transferred successively to Dayton, Ohio, and to the office at the engineer maintenance of way at Cincinnati, Ohio, where he was located at the time of his recent promotion.

Track

T. H. Conway has been appointed acting roadmaster on the Northern Pacific, with headquarters at Bozeman, Mont., succeeding **John Nordquist,** who has been granted leave of absence.

Luman M. Harsha, draftsman on the Western division of the St. Louis-San Francisco, at Enid, Okla., has been promoted to roadmaster at Hugo, Okla., succeeding **W. A. Sizemore,** who has resigned.

S. E. Gordon has been appointed roadmaster on the Marysville division of the Southern Pacific, with headquarters at Marysville, Cal., succeeding **H. H. Notley,** who has been transferred to Colfax, Cal., to replace **T. W. Saul,** who has resigned.

J. Goodrie has been appointed district roadmaster on the First district of the Dakota division of the Great Northern, with headquarters at Breckenridge, Minn., succeeding **F. A. Nolan,** who has been granted an indefinite leave of absence on account of sickness.

O. G. Todd, assistant supervisor on the Connellsville division of the Baltimore & Ohio, with headquarters at Meyersdale, Pa., has been promoted to supervisor on the Wheeling division, with headquarters at Moundsville, W. Va., succeeding **P. Murtaugh,** who had been acting supervisor. **R. L. Scrann** has been appointed assistant supervisor on the Connellsville division, with headquarters at Meyersdale to replace Mr. Todd.

A. T. Kinne, assistant engineer on the Louisville division of the Louisville & Nashville, with headquarters at Louisville, Ky., has been promoted to roadmaster of the Birmingham Mineral division, with headquarters at Birmingham, Ala., where he succeeds **S. Williamson,** who has been transferred to Middlesboro, Ky., to replace **A. B. Gloster,** whose promotion to superintendent of the Cumberland Valley division is noted elsewhere in this issue.

J. L. Leonard, track foreman on the Erie, at Blossburg, Pa., has been promoted to general yard foreman at Hornell, N. Y., succeeding **R. E. Ruby,** who has been promoted to supervisor at Hawley, Pa., to replace **G. Spinnard,** who has resigned. **J. R. Macasey** has been appointed supervisor, with headquarters at Butler, N. J., to succeed **A. F. Doyle,** who has been transferred to Jersey City, N. J., to replace **W. L. Kelly,** who in turn has been transferred to Susquehanna, Pa., in the place of **H. J. Weccheider,** who has been transferred to Buffalo, N. Y., where he succeeds **B. C. Schoonover,** retired.

M. T. Abrahamson, acting roadmaster on the Ashcraft subdivision of the Kamloops division of the Canadian National, with headquarters at Spences Bridge, B. C., has been promoted to roadmaster of the Albreda subdivision of the same division, with headquarters at Blue River, B. C., where he succeeds **J. A. Leslie,** who has been transferred to Spences Bridge to take charge of Mr. Abrahamson's former territory. **F. P. Doyle** has been appointed roadmaster of the Elgin, St. Martins and Sussex subdivisions of the Moncton division, with headquarters at Moncton, N. B., succeeding **J. B. Armstrong,** who has been acting roadmaster.

J. J. Culliton, district roadmaster on the Kansas division of the Union Pacific, with headquarters at Kansas City, Mo., has been promoted to general roadmaster of the same division, with the same headquarters, to succeed **G. H. Warfel,** whose transfer to Omaha, Neb., was noted in the December issue. **W. L. Giggey,** section foreman at Plainville, Kan., has been promoted to district roadmaster on

the Kansas division, with headquarters at Salina, Kan., to replace **John Greening,** who succeeds **Chris Feucht,** with the same headquarters, who has been transferred to Kansas City to the position made vacant by Mr. Culliton's promotion.

C. V. Frisch, whose promotion to track supervisor on the Pennsylvania, with headquarters at Carrothers, Ohio, was noted in the November issue, was born on August 21, 1891, at Gibsonburg, Ohio, and entered railway service as a waterboy, on the Pennsylvania in 1902. He became a trackman at Vernon, Ohio, and was promoted to section foreman at Tiffin, Ohio, on September 12, 1910, serving in this capacity until November 14, of the same year, when he again became a trackman at Vernon. He was again promoted to section foreman at Tiffin on June 14, 1911, and was located at various points in Ohio as a track foreman and extra gang foreman until February 20, 1925, when he was promoted to general foreman at Sandusky, Ohio, serving alternately as general foreman and track foreman at several places in Ohio until the time of his recent promotion to supervisor.

J. F. Sherron, Jr., assistant supervisor on the Reading, with headquarters at Philadelphia, Pa., has been promoted to supervisor, with headquarters at Tuckahoe, N. J., and has been succeeded by **L. B. Lewis,** who has been transferred from Tamaqua, Pa., to Philadelphia. **S. V. Keeler,** assistant supervisor on the New York division, with headquarters at Lansdale, Pa., has been promoted to acting supervisor, with headquarters at Philadelphia, in charge of track work in connection with the elimination of grade crossings at Wissahickon and Manayunk. **Raymond Wescott,** assistant supervisor, with headquarters at Philadelphia, has been promoted to acting supervisor, with headquarters at Olney, Pa., succeeding **P. R. Bickford,** who has been transferred to Spring Garden Station, Philadelphia. **H. K. Modery,** assistant supervisor, with headquarters at Reading, Pa., has been appointed assistant supervisor pro tem, to succeed Mr. Keeler at Lansdale. **C. A. Tracy** has been appointed assistant supervisor, with headquarters at Philadelphia, to succeed **A. C. Palmer,** who has been transferred to Reading to replace Mr. Modery.

Mr. Sherron entered the service of the Reading as a rodman in the chief engineer's office at Harrisburg, Pa., on June 20, 1922, immediately following the completion of his course at the University of Pennsylvania, and on August 16 of the same year was promoted to assistant supervisor, with headquarters at Reading, Pa. He was transferred to Philadelphia on January 1, 1924, where he served alternately as assistant supervisor and acting supervisor until his recent promotion.

Mr. Keeler was born on February 25, 1893, at Kreamer, Pa., and entered the service of the Reading on October 3, 1915, as a transitman in the resident engineer's office at Williamsport, Pa. He was promoted to assistant supervisor, with headquarters at Tamaque, Pa., on March 18, 1918, and was transferred successively to Philadelphia and Lansdale, his headquarters being in the latter city at the time of his recent promotion to supervisor.

Bridges and Buildings

T. F. Kaufman, bridge and building foreman on the Union Pacific, has been promoted to acting bridge and building supervisor, with headquarters at Omaha, Neb., succeeding **W. A. Batey,** who has been transferred to Ogden, Utah, as general foreman on the new terminal facilities.

W. R. Edwards, assistant maintenance engineer of the Baltimore & Ohio, with headquarters at Baltimore, Md., has been promoted to general bridge inspector of the Eastern lines, a newly created position. **Guy Long,** assistant division engineer, with headquarters at Wheeling, W. Va., and **W. O. Nelson** have been appointed district bridge inspectors.

T. P. Soule, assistant supervisor of bridges and buildings on the Syracuse division of the New York Central, with headquarters at Syracuse, N. Y., has been promoted to supervisor of bridges and buildings on the Adirondack and Ottawa divisions, with headquarters at Malone, N. Y., to replace **P. L. Jenkins,** who has been transferred to the Syracuse division, with headquarters at Rochester, N. Y., to succeed **G. J. Klumpp,** whose death is noted elsewhere.

Purchasing and Stores

E. G. Walker, chief clerk in the purchasing department of the Atchison, Topeka & Santa Fe, with headquarters at Chicago, has been promoted to assistant general purchasing agent to succeed **Eugene A. Clifford,** whose appointment as general purchasing agent of the Chicago & North Western and the Chicago, St. Paul, Minneapolis & Omaha, with headquarters at Chicago, was noted in the December issue.

R. L. Tindal, chief clerk to the vice-president and general manager of the Nickel Plate and the Lake Erie & Western districts of the New York, Chicago & St. Louis, with headquarters at Cleveland, Ohio, has been promoted to purchasing agent, with the same headquarters, succeeding **W. F. Dittoe,** who has retired after 45 years of continuous service with the company, of which period he was purchasing agent for the last 27 years.

Samuel Porcher, general purchasing agent of the Pennsylvania, with headquarters at Philadelphia, Pa., has been promoted to the newly created position of assistant vice-president in charge of purchases, stores and insurance, and **C. D. Young,** stores manager, with the same headquarters, has been promoted to general purchasing agent to succeed Mr. Porcher. **B. P. Phillipe,** assistant purchasing agent, with headquarters at Philadelphia, has been promoted to the newly created position of fuel purchasing agent, with the same headquarters. **Montgomery Smith,** purchasing agent, with headquarters at Philadelphia, has been promoted to assistant to the general purchasing agent, and **C. E. Walsh,** assistant purchasing agent, with the same headquarters, has been promoted to purchasing agent to succeed Mr. Smith. **John Foley,** forester, and **E. J. Lamneck,** stationery storekeeper, both with headquarters at Philadelphia, have been promoted to assistants to the purchasing agent. **H. R. Condon,** assistant forester, with headquarters at Philadelphia, has been promoted to forester to succeed Mr. Foley and **W. R. F. Whaley** has been appointed stationery storekeeper to succeed Mr. Lamneck. **C. B. Hall,** general storekeeper, with headquarters at Philadelphia, has been promoted to stores manager to succeed Mr. Young and is succeeded by **R. C. Harris,** assistant to the stores manager, with headquarters at Philadelphia. Mr. Harris is in turn succeeded by **C. J. McIlvaine.**

Mr. Porcher was born in South Carolina on December 21, 1857, and was educated at the University of Virginia. He entered railway service in 1882 as an apprentice in the Altoona shops of the Pennsylvania and remained in the mechanical department at that place until 1888, when he was promoted to assistant engineer motive power of the United Railroads of New Jersey division of the Pennsylvania, with headquarters at Jersey City, N. J. He was promoted to assistant purchasing agent in 1894, and to purchasing agent in 1913. From January, 1918, to March 7, 1919, he was also attached to the office of the director of the division of finance and purchase of the United States Railroad Administration, being appointed a member of the Central Advisory Purchasing Committee of the Railroad Administration on the latter date. On March 15, 1919, he was appointed assistant director, division of purchases, of the railroad administration and acted in that capacity until March 1, 1920, when he was promoted to general purchasing agent of the Pennsylvania, which position he was holding at the time of his recent promotion to assistant vice-president.

Mr. Foley was born on August 1, 1880, at New York and was educated at Columbia University. He entered railway service in May, 1907, as first assistant forester on the Eastern lines of the Pennsylvania and was promoted to forester in February, 1912. In 1920 he was promoted to forester of the Pennsylvania system, which position he was holding at the time of his recent promotion to assistant to the purchasing agent. From May, 1918, to February, 1920, he was also an associate member of the Forest Products section, Division of Purchases and Stores of the United States Railroad Administration.

Obituary

E. C. Ingalls, division storekeeper on the Missouri Pacific, with headquarters at Dupo, Ill., died on December 1.

B. H. Moon, general roadmaster on the Union Pacific, with headquarters at Marysville, Kan., died on December 21, aged 62. Mr. Moon was born at Paterson, N. J., in 1864 and entered the service of the Union Pacific when a young man, with which company he remained until his death, except for brief periods when he was in the service of the Denver & Rio Grande Western and the Denver & Salt Lake.

George J. Klumpp, supervisor of bridges and buildings on the Syracuse division of the New York Central, with headquarters at Rochester, N. Y., died on December 7 at his home in Rochester, after an illness extending over a period of several months, and was buried at Union City, Ind. Mr. Klumpp, who had a continuous railroad service record of over 53 years, started his railroad work as a water boy in a bridge gang on the Indianapolis division of the Cleveland, Cincinnati, Chicago & St. Louis at Union City, Ind, on May 1, 1873. Later he was promoted to a bridge man, and on November 15, 1879, was promoted to bridge and building foreman, which position he held until April 1, 1900, when he came to the New York Central, with headquarters at Rochester, N. Y., as supervisor of bridges and buildings on the old Western division, which comprised what is now the Syracuse, Buffalo and Rochester divisions, in which capacity he was serving at the time of his death.

Alexander Mahon Acheson, vice-president and chief engineer of the Waco, Beaumont, Trinity & Sabine, died on December 29, at his home in Trinity, Tex. Mr. Acheson was born on July 20, 1858, and attended Washington and Jefferson college, Washington, Pa., from 1876 to 1879. He entered railway service in the following year as a rodman on the New York, Lake Erie & Western (now a part of the Erie) and in 1881 he became a levelman on the New York, West Shore & Buffalo (now a part of the New York Central). From 1883 to 1885 he served as a transitman on the Pennsylvania and for the following two years he acted in various capacities on surveys for projected lines of this company. In 1887 he was appointed assistant engineer on the St. Paul, Minneapolis & Manitoba (now a part of the Great Northern), accepting a similar position on the Missouri, Kansas & Texas in 1889. Mr. Acheson was promoted to resident engineer, with headquarters at Dallas, Tex., in the following year, and in 1906 he was appointed division superintendent. In 1909 he was promoted to chief engineer, with headquarters at Dallas, serving from December, 1912, to October, 1914, in addition as chief engineer of operation of the Missouri, Kansas & Texas, with headquarters at St. Louis, Mo. He was then appointed superintendent of the Trinity district, with headquarters at Trinity, Tex., and in September, 1923, he was elected vice-president, general manager and chief engineer of the Waco, Beaumont, Trinity & Sabine, with the same headquarters. Later Mr. Acheson relinquished the duties of general manager but remained as vice-president and chief engineer until his death.

Horace A. Sumner, one time chief engineer of the Denver & Salt Lake, died on December 31 at his home in Denver, Colo. Mr. Sumner was born on March 18, 1845, at Stoughton, Mass., and graduated from Francis Sumner's Academy in 1864. He entered railway service in July, 1864, as a rodman on the Old Colony (now controlled by the New York, New Haven & Hartford. He later served at various times as assistant engineer and resident engineer on subsidiaries of the Chicago, Burlington & Quincy in Iowa and Wisconsin and as assistant engineer on the Denver & Rio Grande. He became chief engineer of the Florence & Cripple Creek Railroad in 1893, and of the El Paso & Northeastern and the Alamogordo & Sacramento Mountain (now parts of the Southern Pacific) in 1895. He was appointed chief engineer of the Denver, Northwestern & Pacific (now a part of the Denver & Salt Lake) in 1902, which position he was holding when he retired from railroad service in 1910.

Construction News

The Ann Arbor, together with the Pennsylvania and the Toledo Terminal, has been ordered by the Toledo, Ohio, city council to submit plans for the abolition of grade crossings at Summit street, Toledo.

The Atchison, Topeka & Santa Fe closed bids on December 14 for the construction of a one-story warehouse, 340 ft. by 40 ft., at Argentine, Kan.

The Atlantic City has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a branch from Cape May to Cape May point, N. J., 2.64 miles.

The Baltimore & Ohio plans the construction of a new freight yard and engine terminal at Cincinnati, Ohio, for which an initial appropriation of $1,390,000 has been made.

The Canadian National has awarded a contract to the Canadian Bridge Company, Walkerville, Ont., for the construction of a bridge across the Athabasca river, 3.5 miles west of Dyke, Alta. The bridge will consist of six 100-ft. deck plate girder spans and abutments. Plans have been prepared for the construction of a new bridge over the La Seine river west of La Seine, Ont., as a part of the realignment work made necessary, over a distance of four miles near this point, by a water power development. The new single track bridge will be made up of one 150-ft. through truss span and two deck plate girders, 40 ft. and 30 ft. long, with substructure for double track. Day labor will be employed in the construction of a concrete and steel bridge to span the Fraser river at Kamloops, B. C., involving an expenditure of about $400,000.

The Canadian Pacific has announced a program of six branch lines in Saskatchewan and Alberta and legislation approving of their construction will be asked of Parliament at the present session. The lines will aggregate over 200 miles.

The Chesapeake & Ohio has awarded a contract to Haley, Chisholm & Morris, Charlottesville, Va., for enlarging and lining with concrete the Brookville tunnel at Greenwood, Va., estimated to cost $200,000. This company will rebuild an arch and enlarge the Red Hill tunnel at Callaghan, Va., at a cost of $214,000.

The Chicago & North Western contemplates the construction of an extension, 16 miles long, near Bellefourche, S. D., to develop a sugar beet raising section. A contract for the construction of a freight transfer shed at Proviso, Ill., 1,400 ft. by 700 ft., has been awarded to Peppard & Burrill, Minneapolis, Minn., at a cost of $850,000. Grading, trackage facilities and platform drawbridges will make the entire project involve an expenditure of $3,000,000.

The Chicago, Burlington & Quincy has been ordered by the Nebraska State Railway Commission to construct a new station at Wilber, Neb., during 1927, to cost about $20,000.

The Cleveland, Cincinnati, Chicago & St. Louis closed bids on December 27 for the construction of an engine terminal and shops at Riverside yards, Cincinnati, Ohio, estimated to cost $700,000.

The Ft. Worth & Denver City is preparing plans for the construction of repair shops at Childress, Tex., estimated to cost with equipment, about $100,000.

The Great Northern has awarded a contract to the Barnett & Record Company, Duluth, Minn., for the construction of the concrete and steel substructure of the third section of ore dock No. 1 at Allouez, Wis. This portion of the project involves an expenditure of about $550,000. This company contemplates the renewal of a bridge at New Westminster, B. C., at a cost of about $51,000. A contract has been awarded to the Puget Sound Light & Power Company for the installation of electrical equipment on the line to be electrified between Skykomish, Wash., and Wenatchee.

The Illinois Central has awarded a contract for the remodeling and enlarging of the passenger station at Jackson, Miss., at a cost of $221,500. A contract has been let

to Earl Cline for the construction of an automobile handling shed at Birmingham, Ala., to cost $25,000. Plans have been prepared for the construction of a two-story passenger station at Belleville, Ill., 143 ft. by 30 ft., to cost about $250,000.

The Lehigh Valley has prepared plans for the construction of approaches and a double track tunnel immediately south of the Musconetcong (N. J.) tunnel. Improvements are also contemplated at the East One Hundred and Forty-ninth street terminal, New York, including construction of a transfer bridge, slip, dockwork and dredging.

The Los Angeles & Salt Lake contemplates the construction of a sanitary sewer system to serve the Harbor district at Wilmington, Cal., and additional trackage and street improvements at an estimated cost of $431,000.

The Louisville & Nashville has awarded a contract to the M. J. Hoffman Construction Company, Louisville, Ky., for the construction of a reinforced concrete, brick and steel roundhouse, machine shop and office building at Evansville, Ind., at a cost of about $200,000. This company is preparing for the construction of freight facilities at Mobile, Ala., at an approximate cost of $168,000. Included in this project are a freight house, 440 ft. by 40 ft., a transfer platform, 193 ft. by 12 ft., and an automobile platform, 150 ft. by 40 ft., each to be constructed of brick and concrete. A contract has been awarded for the construction of a roundhouse at Howell, Ind., with nineteen 110-ft. stalls. Including mechanical installations the brick and concrete structure will cost about $269,800.

The Mobile & Ohio has awarded a contract for the reconstruction of a 400-ft. elevator conveyor at Mobile, Ala., destroyed by a recent storm, to B. E. Buffalo & Co., Mobile, at a cost of about $15,000. The installation of equipment is expected to require an additional expenditure of $7,000.

The Missouri-Kansas-Texas has acquired 15 acres of land at Houston, Tex., for the construction of a terminal and freight warehouse. Including the cost of the land and trackage facilities the warehouse project involves an expenditure of about $1,100,000.

The Missouri Pacific has awarded a general contract to the List Construction Company, Kansas City, Mo., for the construction of a union passenger station and terminal at Texarkana, Tex., to be jointly owned and used by the Missouri Pacific, the Texas & Pacific, the St. Louis-Southwestern and the Kansas City Southern. The cost of the entire project is estimated at $1,350,000. This company contemplates the construction of brick passenger, freight and express stations at San Juan, Tex., to replace the combination building recently destroyed by fire. Between Bishop and Robstown, 18 miles, the track will be raised three feet to place it above flood water level which will include the raising of all bridges. Plans have also been prepared for the construction of an industry track 4,285 feet long, at San Benito, Tex., and for the construction of new and lengthening of old passing tracks at McAllen, Tex., La Feria, Alamo, Mercedes, Weslaco, Donna, San Juan, Pharr and Mission. The contract for the excavation and placing of the foundations of the new 22-story office building at St. Louis, Mo., has been awarded to the John Hill Construction Company, St. Louis. This company contemplates the construction of a water treating plant at Little Rock, Ark., to cost about $16,000. Bids closed on December 29 for the grading and bridging for 29.2 miles of second track at four different points between St. Louis, Mo., and Jefferson City. This project is expected to involve an expenditure of about $3,000,000. A contract for the grading and bridging of a 7.5 mile extension extending from Nashville, Ark., has been let to the W. P. McGeorge & Co., Pine Bluff, Ark., at a cost of about $230,000. The same contractor has been awarded a contract for the grading and bridging of an extension between Hot Springs, Ark., and Hawes, to cost about $400,000.

The New York Central has awarded a contract for repairing the pier of Bridge 141, Kingston, N. Y., to cost about $65,000, to O'Brien Brothers, Inc.; and a contract for alterations to Pier 12 and the Express Pier, at Weehawken, N. J., to cost about $85,000, to the G. W. Rogers Construction Corporation; and the contract for eliminating grade crossings at Fullers, N. Y., to cost about $150,000, to the Walsh Construction Company, Davenport, Ia. A contract has been let for the construction of a through girder bridge to carry four main tracks over the Lincoln Highway at Rolling Prairie, Ind., the railroad's share of the cost of this project being $86,000. The projected separation of grades at South Bend, Ind., at a total cost of about $8,000,000, involves the construction of eleven four track highway subways, new through and station tracks, a freight station and team tracks. Present executive authority has appropriated $1,225,000 for this work. A contract has been let to the Roberts & Schaefer Company, Chicago, for the installation of a multiple pit "N. & W." type standard electric cinder plant at Corning, Ohio.

The Pennsylvania has announced that an immediate start will be made upon the construction of improved freight terminal facilities at Little Creek, near Norfolk, Va. This action followed issuance by the War Department, of a permit covering the channel dredging and breakwater work which formed part of the new terminal project. Construction of the new terminal facilities will provide the Pennsylvania a shorter and more advantageous route for ferrying across the mouth of the Chesapeake Bay between Cape Charles and Norfolk. The new route reduces the former 36-mile trip to approximately 24 miles, with complete avoidance of the congested waters and a corresponding increased ease of operation. A contract has been awarded to the Dunbar & Sullivan Dredging Company, Detroit, Mich., for dredging in dock No. 10 at Ashtabula, Ohio, estimated to cost $30,000. Plans have been prepared for the relocation of the inbound station and the rearrangement of facilities of the American Railway Express Company at Polk street, Chicago, at a cost of $180,000. A contract has been let to the Ogle Construction Company, Chicago, for the construction of a 500-ton reinforced concrete automatic electric coaling station at East Rochester, Ohio.

The Reading contemplates the construction of a connection between its Lebanon Valley and Steelton branches at Harrisburg, Pa., at an approximate cost of $510,000. A number of bridges are involved including those planned at Cameron street, Paxton creek, Hemlock street and Sycamore street. Plans have been prepared for additional passenger, freight and express facilities at Pottstown, Pa., which with elimination of a grade crossing and construction of a fifth main track are expected to cost $1,480,000. Plans involving an expenditure of $280,000 have also been prepared for a change of alignment and the replacement of a viaduct at Mainville, Pa. Improvements contemplated at Philadelphia, Pa., include elimination of grade crossings between Wissahickon Creek and Fountain street, Manayunk, at an estimated cost of $4,500,000, to be borne equally with the city of Philadelphia, and construction of a three-story warehouse at Twentieth and Hamilton streets to cost $220,000.

The St. Louis-San Francisco has asked for bids for the construction of a brick combined freight and passenger station at Boynton, Okla., estimated to cost $15,000. Bids have also been asked for the construction of a 50-ton coaling station at Chouteau avenue, St. Louis, Mo., as an alternate bid following the original request for bids on a station of 100-tons capacity. This company and the city of St. Louis, Mo., have reached an agreement whereby the city will contribute $185,000 to the cost of constructing a $485,000 reinforced concrete viaduct to carry Arsenal street over the company tracks and the river Des Peres. Plans call for a four-span structure 1,750 ft. long and 60 ft. wide.

The Southern Pacific contemplates the construction of 6.3 miles of second track between San Luis Obispo, Cal., and Hadley, including a drill track, three crossovers and 1.89 miles of yard tracks. A contract has been awarded for the strengthening of a steel bridge, 1,692 ft. long, over the Rio Grande river at El Paso, Tex., including the addition of one truss to each span. A contract for the construction of freight stations at Edinburg, Tex., and McAllen has been let to R. W. Abbott, McAllen. Each station has outside

dimensions of 90 ft. by 30 ft., with loading docks 40 ft. by 30 ft., and together they involve an expenditure of about $21,000.

The Texas & Pacific has awarded a contract for the construction of a two-story reinforced concrete and brick passenger station at Natchitoches, La., to the Christy-Dolph Construction Company, Dallas, Tex. The structure, which will also house express facilities, will cost about $50,000.

The Texas, Panhandle & Gulf has been denied a reopening of the case in which the Interstate Commerce Commission recently authorized the construction of over 200 miles of line in Texas by the Fort Worth & Denver South Plains and the Quanah, Acme & Pacific, but denied the application of the T., P. & G. for a certificate authorizing the construction of a line from Tucumcari, N. M., to Fort Worth, Tex.

The Union Pacific is receiving bids for the construction of shop buildings and an enginehouse at Ogden, Utah.

The Yazoo & Mississippi Valley has awarded a contract to the Railroad Water & Coal Handling Company, Chicago, for the construction of a 300-ton coaling station at Lambert, Miss., at a cost of about $50,000.

Trade Publications

Simplicity—Accessibility.—The Fairmont Railway Motors, Inc., has issued a six-page circular in which it calls attention to the way in which simplicity and accessibility of parts have been provided for in its motor cars for track use.

Automatic Coaling Plants.—In a 20 page bulletin, No. 85, the Roberts & Schaefer Company, Chicago, describes and illustrates in detail the construction of its Simplex Automatic Electric Coaling plants, together with views of several installations of various capacities.

Winter Construction Tools.—The Aeroil Burner Co., Inc., Union City, N. J., has issued a 24-page bulletin, designated as No. 52, in which it illustrates and describes its winter construction tools, including concrete heaters, thawing torches, mortar heating pans, salamanders, water heaters and furnace burners.

Kyrock for Railway Use.—The Kentucky Rock Asphalt Company, Louisville, Ky., has issued a 15 page bulletin describing Kentucky rock asphalt and its uses for railroad grade crossings, platforms, runways and floors. The bulletin is copiously illustrated with views of installations for various purposes. Specifications for the use of Kyrock in the construction of grade crossings, platforms and other facilities accompany the bulletin.

Volute Centrifugal Pumps.—The Ingersoll-Rand Company, New York, has issued Bulletin Form 7059 of 24 pages describing the Cameron single-stage, double-suction volute pumps which are manufactured in three classes for different requirements. The details of construction for each class of pump are shown in sectional views and there are also a number of illustrations of actual installations for various kinds of service.

Steel Rolling Doors.—The Cornell Iron Works, Inc., Long Island City, N. Y., has recently issued a 32-page catalog illustrating and describing the various types of steel rolling doors and labeled Underwriters' rolling fire doors manufactured by that company. This catalog includes also about 50 actual installation views of the various types of doors and gives complete details of their construction with full dimensions and specifications.

Celite in Concrete.—In Bulletin 325 the Celite Products Company, Los Angeles, Cal., presents additional information and test data on Celite as an admixture in concrete. This includes technical data on the effect of siliceous admixtures in increasing the workability of concrete and in improving the uniformity and water-tightness of the resulting concrete. Some of this information is in the form of tests of compressive strengths of plain concrete and concrete in which Celite has been used. The bulletin also gives directions for the use of celite, including the percentages recommended for various concrete mixes.

Supply Trade News

The Keystone Steel & Wire Company, Peoria, Ill., has appointed Theodore Geissman & Co., Chicago, its district sales agent.

The Sullivan Machinery Company, Chicago, has moved its office at Butte, Mont., from 48 E. Broadway to 54 E. Broadway.

Charles M. Griffith, a director and, for some years past, sales manager of William Wharton, Jr., & Co., Inc., Easton, Pa., has been elected vice-president.

John R. McGinley, chairman of the board of directors and formerly president of the Duff Manufacturing Company, Pittsburgh, Pa., and a director of Dwight P. Robinson, Inc., New York, died in New York on November 29, at the age of 75 years after an illness of several months.

The Armco Culvert & Flume Manufacturers' Association has been changed to the **Armco Culvert Manufacturers' Association.** This change in name does not imply any change in policy and the association will continue to devote its efforts to research in all matters relating to drainage and irrigation and to educational publicity for making this research known to those who are interested in such matters.

Orrin H. Baker, of the sales department of the Illinois Steel Company, has been promoted to assistant general manager of sales to succeed **P. W. O'Brien,** whose death was noted in the December issue. Mr. Baker was born in 1885 at Hamilton, Ont., and was graduated from the University of Illinois in mechanical engineering in 1907. He entered the service of the Illinois Steel Company in the same year as a chemist at South Chicago plant and during the next five years worked in all the departments of the steel mill, principally on blast furnace practice. From 1910 to 1912 he was special assistant to the general superintendent and devoted his time to engineering and production problems. He entered the sales department in 1912, being engaged in railroad and structural sales. In 1917, he was appointed representative of the American Iron & Steel Institute on the Pacific coast in charge of the allocation of steel for the engineering fleet. He returned to the sales department of the Illinois Steel Company in 1919 and was engaged in the work of the railroad bureau, which position he was holding at the time of his recent promotion.

Orrin H. Baker

O. C. Badger, engineer in the Railways Bureau of the Portland Cement Association, Chicago, has resigned to become general manager of the Permanent Waterproofing Company, 122 South Michigan avenue, Chicago, effective January 1. Mr. Badger was born at Niles, Mich., on March 31, 1891, and graduated from Armour Institute in 1913 in civil engineering. From 1915 to 1917 he was employed in the office of the chief engineer of the Atchison, Topeka & Santa Fe, Eastern lines, at Topeka, Kan., and from February, 1917, to March, 1926, he was employed as assistant to the bridge engineer of the Santa Fe system with headquarters at Chicago. On the latter date he left the service of the Santa Fe to become engineer in the Railways Bureau of the Portland Cement Association, which position he held until his recent resignation.

Regrind it on the Job—Instead of Redressing it in the Shop!

← *"Slim Pattern" Cut Devil Track Chisel*

A power or hand grinder easily sharpens the slender bit—right on the job.

Uniform heat-treatment *all the way* through the slender bit prolongs the life of the Cut Devil.

Think what this means:

Faster work—Longer life—More rails per chisel—Fewer chisels on the job—A net saving of at least 40% over the expense of using ordinary carbon steel chisels.

That's talking the language of a track gang, and a purchasing agent, too!

Just try the Cut Devil "Slim Pattern"
—that's all we ask.

← *Look for the Label*

The Warren Tool & Forge Co. · Devil Tools · WARREN OHIO

Cut Devil Chisel

THE WARREN TOOL & FORGE CO.
243 Griswold Street, Warren, Ohio

Oil Gardner *Self-lubricating* Pumps

Once a month

No oil cups—no grease cups. Fill the crankcase once a month and every bearing in a Gardner self-lubricating Pump automatically secures perfect lubrication, insuring long life and few replacements.

Made in all styles and capacities. Send for Bulletins EP-1 and EP-2.

"Quality Builders for Over 65 Years"

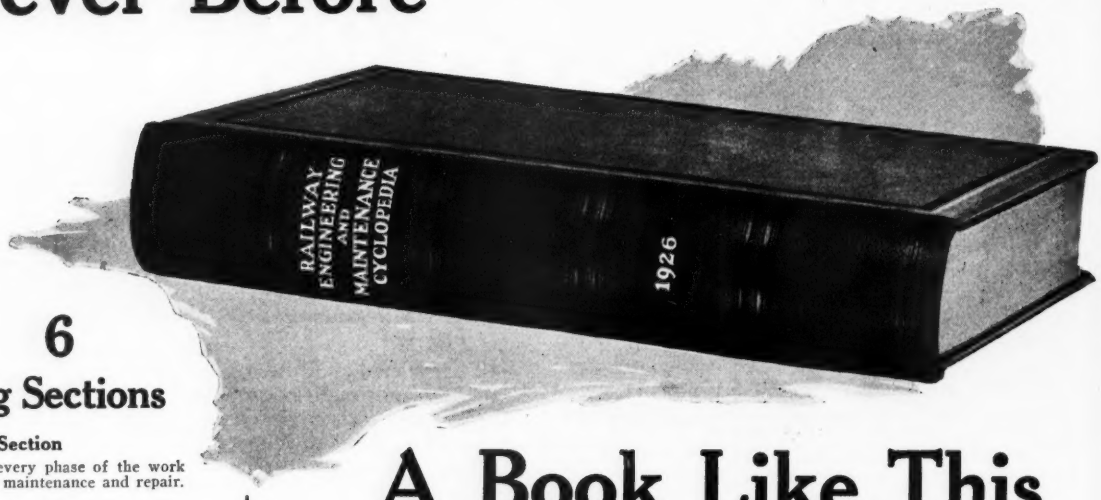
THE GARDNER GOVERNOR CO.
Quincy, Illinois

CHICAGO 549 Washington Blvd. | NEW YORK 534 Singer Bldg. | PHILADELPHIA 604 Arch St. | MUSKOGEE 323 Dayton St. | HOUSTON 611 2d Nat'l Bank Bldg.
SAN FRANCISCO 401 Rialto Bldg. | LOS ANGELES 684 Santa Fe Ave. | LONDON 25 Bishopsgate, E.C.2

GARDNER GOVERNORS PUMPS · COMPRESSORS

GARDNER

Never Before



6 Big Sections

Track Section
Covers every phase of the work of track maintenance and repair.

Bridge Section
Covers the construction and repair of all kinds of railroad bridges and the equipment used in bridge work.

Building Section
Every conceivable kind of building used by railroads, its construction and maintenance, described in detail in this section.

Water Service Section
Describes sources of water supply, water treatment and methods of distribution and storage.

Signal Section
The first authoritative treatment of railway signaling in many years. Covers new developments and improved devices and practices.

General Section
Covers Wood Preservation, Timber, Metal, Paint, Cranes, Grab Buckets, Power Units, Rope and Chain, etc.

A Book Like This At $5.00

From cover to cover the new Railway Engineering and Maintenance Cyclopedia is new and up-to-the-minute—distinctly different from anything ever before published on engineering, maintenance and signaling!

The developments made in recent years in labor saving machinery, devices, practices, etc., are fully covered for the first time in this new cyclopedia. Every phase of engineering, maintenance and signaling work receives detailed attention at the hands of the experts, who gathered this wealth of information into one book for you.

Important information prepared for you by experts

Six big sections; namely, track, bridge, building, water service, signaling, and general, supply you with hundreds of hard facts that will prove indispensable. Each of these sections would make a fair sized book in itself and covers its subject exhaustively from a practical angle. Months of extensive research by experts whose experience and knowledge of these subjects is widely recognized, together with the co-operation given by committees of the American Railway Engineering Association and of the Signal Section of the American Railway Association, made possible the new improved cyclopedia.

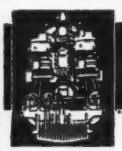
A Library in One Volume

The new cyclopedia is veritably a library in one volume. It contains over 1,000 pages liberally illustrated by photographs and drawings. If you are asked to pass upon any device or piece of equipment, or if your duties require that you put it to use, you will recognize this Cyclopedia as an indispensable assistant. You must know! You must act! You must stand behind the action taken! Therefore you need the exhaustive information that only the Cyclopedia can give! Get your copy now.

See a copy for 10 Days FREE

You are under no obligation whatsoever to see this book for 10 DAYS' FREE EXAMINATION. You may return it if it is not worth every cent of $5.00. In fact we will go a step further—don't keep it unless it is worth twice that amount to you. You will surely find this book of great help and we have no fear of it coming back—Why, the charts alone are worth the price of the book. Order your copy TO-DAY.

Over 1,000 pages, 1,000,000 words of text, fully illustrated, 9x12 inches.
Cloth, $5.00. Leather, $7.00. Net postpaid.



SIMMONS-BOARDMAN
FREE EXAMINATION COUPON

Simmons-Boardman Publishing Company,
Book Department,

30 Church Street, New York, N. Y.; 34 Victoria St., London, S. W. 1.

Send me postpaid a copy of the { $5.00 cloth / $7.00 leather } Railway Engineering and Maintenance Cyclopedia for ten days' free examination. After ten days I will remit the total price, or if I do not desire to keep the book I will return it to you in good condition at your expense.

NAME.....
ADDRESS.....
CITY..... STATE.....
POSITION..... COMPANY.....

M T 1-27

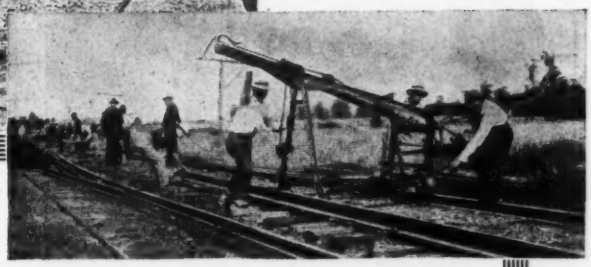
SIMMONS-BOARDMAN PUBLISHING CO.
Book Department

30 Church Street
New York, N. Y.

34 Victoria Street
London, S. W. 1

Big gang laying steel by hand. →

Small gang making record with "Three-Man Rail Layer" →



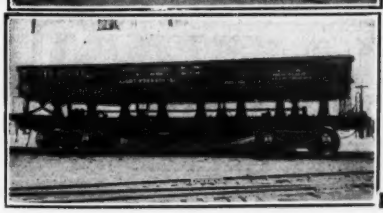
When a Small Gang Out-works A Big One

Give a small gang a "Three-Man Layer" and watch it lay more steel than a gang twice its size doing the work by hand.

The "Three-Man Rail Layer" is a light, hand-operated machine offering all the advantages of speed and economy of a power-driven unit. In addition, its lightness allows it to be removed from the track—thus fast track laying is accomplished without tying up traffic.

MAINTENANCE EQUIPMENT COMPANY

Railway Exchange Building, Chicago, Illinois



MAGOR

Improved Automatic Air Dump CARS

Are built to serve a rapidly widening range of railroad requirements

DESIGNED to produce the most satisfactory results with lowest possible operating costs, maximum safety of operation, quick discharge and return.

Dumping can be controlled from locomotive or cars can be operated separately. Cars dump in either direction instantly without change of parts or any preliminary adjustment.

20 cu. yds. 40 Tons — *Write for Catalogue "D" with description and prints* — **30 cu. yds. 50-70-75 Tons**

MAGOR CAR CORPORATION

30 Church St. **New York City**

Works: Passaic, N. J.

Buyers' Guide

CLASSIFIED INDEX TO ADVERTISERS

Acetylene Dissolved
Oxweld Railroad Service Company

Air Compressors
Fairbanks, Morse & Co.
Gardner Governor Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Generator Set
Buda Company

Air Hoists
Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Lift Pumping Machinery
Gardner Governor Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Anchors, Rail
See Rail Anchors

Anti-Creepers, Rail
Bethlehem Steel Co.
Lundie Engineering Co.
P. & M. Co.
Verona Tool Works

Asbestos Products
Johns-Manville Corp.

Ash Conveyors
McMyler Interstate Co.

Asphalt
Barber Asphalt Co.
Lehon Co.
Kentucky Rock Asphalt Co.

Ballast Cars
Clark Car Company

Ballast Screens
Maintenance Equipment Co.

Ballast Spreaders
Jordan Co., O. F.
Western Wheeled Scraper Co.

Band Saws
American Saw Mill Mach. Co.

Bars
Bethlehem Steel Co.
Interstate Iron & Steel Co.

Bearings, Axle
Buda Company
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Company
Northwestern Motor Co.
Woolery Machine Co.

Bearings, Roller
Hyatt Roller Bearing Co.

Bed Springs
Royal Blue Bed Spring Co.

Benders, Rail
See Rail Benders

Bolts
Bethlehem Steel Co.
Interstate Iron & Steel Co.
Graham Bolt & Nut Co.

Bonding Outfits, Rail
Ingersoll-Rand Co.

Bridge Warnings
Hastings Signal & Equip. Co.

Buckets
McMyler Interstate Co.

Buckets, Tote
Railroad Accessories Corp.

Buckets, Clam Shell
McMyler Interstate Co.

Building Beams, Concrete
Federal Cement Tile Co.
Massey Concrete Prod. Corp.
R. C. Products Co., Inc.

Building Material
Johns-Manville Corp.

Building Papers
Lehon Co.

Bumping Posts
Buda Company
Mechanical Mfg. Co.

Bunks
Royal Blue Bed Spring Co.

Calcium Carbide
Oxweld Railroad Service Co.

Car Dumpers
McMyler Interstate Co.

Cars, Ballast
See Ballast Cars

Cars, Dump
See Dump Cars

Cars, Hand
Buda Co.
Fairbanks, Morse & Co.
Fairmont Ry. Motors, Inc.
Kalamazoo Ry. Supply Co.
Mudge & Co.
Northwestern Motor Co.

Cars, Industrial
Clark Car Co.
Magor Car Corp.
Western Wheeled Scraper Co.

Cars, Inspection
Buda Co.
Euclid Electric & Mfg. Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Cars, Motor
Buda Co.
Euclid Elecric & Mfg. Co.
Fairbanks, Morse & Co.
Fairmont Ry. Motors, Inc.
Kalamazoo Ry. Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Cars, Section
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Car, Spreader
Clark Car Co.
Jordan Co., O. F.
Western Wheeled Scraper Co.

Car Stop, Friction
Maintenance Equipment Co.

Cars, Velocipede
Buda Company
Fairbanks, Morse & Co.
Kalamazoo Railway Supply Co.

Castings
Bethlehem Steel Co.
Wharton, Jr. & Co., Inc., Wm.

Cattle Guards
Fairbanks, Morse & Co.
Kalamazoo Railway Supply Co.

Cattle Passes
Massey Concrete Products Corp.

Cement, High Temperature
Johns-Manville Corp.

Cement Repair
Barber Asphalt Co.
Carey Co., Philip

Chains
American Chain Co., Inc.

Clamshell Buckets
See Buckets, Clamshell

Coal, Ore & Ash Handling Machinery
McMyler Interstate Co.

Coaling Stations
Fairbanks, Morse & Co.

Compressors
Gardner Governor Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Compromise Joints
See Joints, Compromise

Concrete Units, Miscellaneous
Federal Cement Tile Co.
Massey Concrete Prod. Corp.
R. C. Products Co., Inc.

Condensers
Ingersoll-Rand Co.

Conveying Machinery
McMyler Interstate Co.

Corrugated Iron
Armco Culvert & Flume Mfrs. Ass'n.

Cots
Royal Blue Bed Spring Co.

Cranes, Barge, Electric Erecting, Gantry, Locomotive, Pillar, Transfer, Tunnel, Wharf and Wrecking.
McMyler Interstate Co.

Creosoted Timber
See Timber, Creosoted

Cribbing, Concrete
Federal Cement Tile Co.
Massey Concrete Products Corp.
R. C. Products Co., Inc.

Crossing Gates
Buda Co.
Kalamazoo Railway Supply Co.

Crossings, Highway
Carey Co., Philip
Kentucky Rock Asphalt Co.

Crossings, Rail
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Crushers, Stone
Western Wheeled Scraper Co.

Culvert Pipe
American Cast Iron Pipe Co.
Armco Culvert & Flume Mfrs. Ass'n.
Massey Concrete Products Corp.

Curbing
Massey Concrete Products Corp.

Derails
American Chain Co., Inc.
Q & C Co.
Wharton Jr. & Co., Wm.

Derrick Cars
Maintenance Equipment Co.

Derricks
McMyler Interstate Co.

Diesel Engines
Fairbanks, Morse & Co.

Diesel Electric Power Plants
Fairbanks, Morse & Co.

Discing Machines
Fairmont Railway Motors, Inc.

Disinfectants
Chipman Chemical Engineering Co.

Ditchers
Jordan Co., O. F.

Ditching Machinery
McMyler Interstate Co.

Dredging Machinery
McMyler Interstate Co.

Drills, Earth
Buda Co.

Drills, Rock
Ingersoll-Rand Co.
Sullivan Machinery Co.
Verona Tool Works

Drill Steel, Rock
Ingersoll-Rand Co.
Sullivan Machinery Co.

Drills, Track
Buda Co.
Ingersoll-Rand Co.
Kalamazoo Railway Supply Co.
Railroad Accessories Corp.

Dump Cars
Clark Car Co.
Jordan Co., O. F.
Western Wheeled Scraper Co.

Electric Cranes (Locomotive, Pillar, Transfer & Wrecking)
See Cranes

Electric Light & Power Plants
Fairbanks, Morse & Co.

Electric Power Units
Electric Tamper & Equipment Co.
Euclid Electric Co.
Northwestern Motor Co.
Syntron Co.

Electric Snow Melters
Q & C Co.

Engines, Gasoline
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Ingersoll-Rand Co.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Engines, Hoisting
McMyler Interstate Co.

Engines, Motor Car
Buda Co.
Euclid Electric & Mfg. Co.
Fairbanks, Morse & Co.
Fairmont Railway Motor Co.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

Engines, Oil
Buda Co.
Fairbanks, Morse & Co.
Ingersoll-Rand Co.

Fences
Cyclone Fence Co.
Page Fence & Wire Products Ass'n.
Q & C Co.

Fence, Fabric
Cyclone Fence Co.
Interstate Iron & Steel Co.
Page Fence & Wire Products Ass'n.

Fence Posts
Maintenance Equipment Co.
Massey Concrete Products Corp
Page Fence & Wire Products Ass'n.
Q. & C. Co.

Fibre Angle Pieces, Bushings, Plates, etc.
Q. & C. Co.

Fibre Insulating
Q. & C. Co.

Filters
American Water Softener Co.

Fire Fighting and Protection Equipment
Johns-Manville Corp.

Flangers, Snow
Q. & C. Co.

Float Valves
Fairbanks, Morse & Co.

Flood Lights
Universal Generator Co.

Floor Coverings
Barber Asphalt Co.
Lehon Co.

Flooring Compositions
Johns-Manville Corp.

Forgings
Bethlehem Steel Co.
McMyler Interstate Co.

Frogs
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Inc., Wm.

Gages, Measuring
Lufkin Rule Co.

Gages, Pressure Gas
Oxweld Railroad Service Co.

Gas, Acetylene
Oxweld Railroad Service Co.

Governors
Gardner Governor Co.

Graders, Elevating
Western Wheeled Scraper Co.

Grading Machinery
Western Wheeled Scraper Co.

Graphite
Dixon Crucible Co., Jos.

Grinders, Portable
Buda Co.
Ingersoll-Rand Co.

Guard Rails
American Chain Co., Inc.
Bethlehem Steel Co.
Buda Co.
Q. & C. Co.
Ramapo Ajax Corp
Wharton Jr. & Co., Wm.

Guard Rail Clamps
American Chain Co,, Inc.
Bethlehem Steel Co.
Buda Co.
Q. & C. Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Hammer Drills
Ingersoll-Rand Co.
Sullivan Machinery Co.

Hammers, Forge
Sullivan Machinery Co.

Hammers, Riveting
Ingersoll-Rand Co.
Sullivan Machinery Co.

Hand Car Bearings
Hyatt Roller Bearing Co.

Heaters, Feed Water
American Water Softener Co.

Highway Crossings
Barber Asphalt Co.

Hoisting Machinery
Fairbanks, Morse & Co.
Ingersoll-Rand Co.
McMyler Interstate Co.

Hose
Ingersoll-Rand Co.

House Lining
Barber Asphalt Co.
Lehon Co.

Inspection Cars
See Cars, Inspection

Insulated Rail Joints
Bethlehem Steel Co.
Q. & C. Co.
Rail Joint Co.

Insulating Material
Barber Asphalt Co.
Johns-Manville Corp.
Lehon Co.

Jacks, Bridge
Buda Co.
Duff Manufacturing Co.
Kalamazoo Railway Supply Co.

Jacks, Smoke
Johns-Manville Corp.

Jacks, Track
Buda Company
Duff Manufacturing Co.
Hackmann Railway Supply Co.
Kalamazoo Railway Supply Co.
Verona Tool Works

Joints, Compromise
American Chain Co., Inc.
Bethlehem Steel Co.
Q. & C. Co.
Rail Joint Co.

Joints, Rail
American Chain Co., Inc.
Bethlehem Steel Co.
Q. & C. Co.
Rail Joint Co.
Wharton Jr. & Co., Wm.

Joints, Step
American Chain Co., Inc.
Q. & C. Co.
Rail Joint Co.

Junction Boxes
Massey Concrete Products Corp.

Knuckles, Emergency
Q. & C. Co.

Liners, Track
Hackmann Railway Supply Co.
Rail Joint Co.

Lights, Acetylene
Universal Generator Co.

Lights, Portable Flood
Universal Generator Co.

Lock Washers
National Lock Washer Co.
Reliance Manufacturing Co.

Locomotives, Oil Engine Electric Driven
Ingersoll-Rand Co.

Lubricants
Dixon Crucible Co., Jos.

Lumber, Asbestos
Johns-Manville Corp.

Manganese Track Work
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Manholes
Massey Concrete Products Corp.

Markers
Massey Concrete Products Corp.

Mechanical Painting Equipment
Matthews Corp., W. N.

Mile Posts
Massey Concrete Products Corp.

Motor Bearings
Hyatt Roller Bearing Co.

Motor Car Accessories
Mudge & Company

Motor Cars
See Cars, Motor

Motors and Generators
Fairbanks, Morse & Co.

Mowing Machines
Fairmont Railway Motors, Inc.
Mudge & Co.

Nut Locks
National Lock Washer Co.
Reliance Manufacturing Co.
Verona Tool Works
Woodings Forge & Tool Co.

Nuts
Bethlehem Steel Co.
Graham Bolt & Nut Co.
Interstate Iron & Steel Co.

Oil Engines
See Engines, Oil

Out Houses
Massey Concrete Products Corp.

Oxygen
Oxweld Railroad Service Co.

Oxy-Acetylene Welding Equipment
Oxweld Railroad Service Co.

Packing, Asbestos
Johns-Manville Corp.

Paint
Dixon Crucible Co., Jos.

Paint, Metal Protecting
Barber Asphalt Co.
Dixon Crucible Co., Jos.

Paint Spraying Equipment
Matthews Corp., W. N.

BUYERS' GUIDE

Pavement Breakers
Ingersoll-Rand Co.
Sullivan Machinery Co.
Penstocks
Fairbanks, Morse & Co.
Pile Drivers
McMyler Interstate Co.
Piling
International Creosoting & Construction Co.
Massey Concrete Products Corp.
Pinion Puller
Duff Manufacturing Co.
Pipe, Cast Iron
American Cast Iron Pipe Co.
Cast Iron Pipe Publicity Bureau
U. S. Cast Iron Pipe & Foundry Co.
Pipe Carriers
Massey Concrete Products Corp.
Pipe, Concrete
Massey Concrete Products Corp.
Pipe, Corrugated
Armco Culvert & Flume Mfrs. Ass'n
Pipe, Sewer
Massey Concrete Products Corp.
Pipe Joint Compound
Dixon Crucible Co., Jos.
Platforms, Asphalt
Kentucky Rock Asphalt Co.
Plows, Railroad
Western Wheeled Scraper Co.
Poles
International Creosoting & Construction Co.
Massey Concrete Products Corp.
Post Hole Digger
Buda Company
Posts, Fence
See Fence Posts
Posts, Bumping
See Bumping Posts
Power Plants, Portable
Electric Tamper & Equipment Co.
Northwestern Motor Co.
Syntron Co.
Preformed Track Pavement
Carey Co., Philip
Preservation, Timber
International Creosoting & Construction Co.
Products, Gas
Oxweld Railroad Service Co.
Pumps, Air Pressure & Vacuum, Centrifugal, Deep Well, Piston, Plunger, Rotary, Slump
American Well Works
Fairbanks, Morse & Co.
Gardner Governor Co.
Ingersoll-Rand Co.
Layne & Bowler Mfg. Co.
Sullivan Machinery Co.
Push Cars
Buda Company
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Push Car Bearings
Hyatt Roller Bearing Co.

Rail Anchors
Bethlehem Steel Co.
Lundie Engineering Corp.
P. & M. Co.
Verona Tool Works
Rail Anti-Creepers
See Anti-Creepers, Rail
Rail Benders
American Chain Co., Inc.
Buda Co.
Q & C Co.
Verona Tool Works
Rail Bonds
Verona Tool Works
Rail Braces
Bethlehem Steel Co.
Buda Co.
Q & C Co.
Ramapo Ajax Corp.
Wharton Jr., & Co., Wm.
Rail Crane
Parsons Company
Rail Expanders
Ramapo Ajax Corp.
Rail Joints
See Joints, Rail
Rail Layers
Maintenance Equipment Co.
Rail Saws, Portable
Kalamazoo Railway Supply Co.
Q & C Co.
Rail Springs
Verona Tool Works
Rails, Girder
Bethlehem Steel Co.
Rails, Tee
Bethlehem Steel Co.
Regulators, Oxy-Acetylene
Oxweld Railroad Service Co.
Removers, Paint
Mudge & Co.
Replacers, Car
American Chain Co., Inc.
Buda Co.
Q & C Co.
Retaining Walls, Precast
Federal Cement Tile Co.
Massey Concrete Product Corp.
R. C. Products Co., Inc.
Rivets
Bethlehem Steel Co.
Interstate Iron & Steel Co.
Rods, Welding
Oxweld Railroad Service Co.
Rods, Wire
Interstate Iron & Steel Co.
Roof Slabs
Federal Cement Tile Co.
Massey Concrete Products Corp.
Roofing, Asbestos
Johns-Manville Corp.
Roofing Composition
Barber Asphalt Co.
Lehon Co.
Roofing, Corrugated
Johns-Manville Corp.
Rules
Lufkin Rule Co.
Saw Mills
American Saw Mill Machy. Co.
Saws, High Speed Friction
American Saw Mill Machy. Co.
Saw Rigs
American Saw Mill Machy. Co.
Fairbanks, Morse & Co.

Scales, Tape
Lufkin Rule Co.
Scales, Track
Fairbanks, Morse & Co.
Scrapers, Wheel, Drag & Buck
Western Wheeled Scraper Co.
Screw Spike Drivers
Ingersoll-Rand Co.
Section Cars
See Cars, Section
Sharpeners, Rock Drill Steel
Ingersoll-Rand Co.
Sheathing Paper
Barber Asphalt Co.
Lehon Co.
Sheet Iron
Armco Culvert & Flume Mfrs. Ass'n.
Sheets, Corrugated
Johns-Manville Corp.
Shingles, Composition
Barber Asphalt Co.
Lehon Co.
Shovels
Verona Tool Works
Woodings Forge & Tool Co.
Siding, Corrugated and Plain
Johns-Manville Corp.
Signal Foundations, Concrete
Massey Concrete Products Corp.
Signals, Bridge Warnings
Hastings Signal & Equip. Co.
Skid Shoes
Q & C Co.
Slabs, Concrete
Massey Concrete Products Corp.
Smoke Stacks
Massey Concrete Products Corp.
Snow Melting Devices
Q & C Co.
Snow Plows
Jordan Co., O. F.
Q & C Co.
Spikes
Bethlehem Steel Co.
Interstate Iron & Steel Co.
Spreader Cars
See Cars, Spreader
Spreaders, Ballast
See Ballast Spreaders
Standpipes (Penstock)
Fairbanks, Morse & Co.
Stands, Switch & Target
Bethlehem Steel Co.
Q & C Co.
Ramapo Ajax Corp.
Steel, Alloy
Interstate Iron & Steel Co.
Steel Plates and Shapes
Bethlehem Steel Co.
Step Joints
See Joints, Step.
Structural Steel
Bethlehem Steel Co.
Switches
Bethlehem Steel Co.
Buda Company
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.
Switchmen's Houses
Massey Concrete Products Corp.
Switchpoint Protector
Maintenance Equipment Co.

Switchstands & Fixtures
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.
Tampers, Tie
See Tie Tampers
Tank Fixtures
Fairbanks, Morse & Co.
Tape, Insulating
Johns-Manville Corp.
Tapes, Measuring
Lufkin Rule Co.
Tee Rails
See Rails, Tee.
Telephone Service, Long Distance
American Telephone & Telegraph Co.
Telegraph Poles
See Poles
Telegraph Service, Long Distance
American Telephone & Telegraph Co.
Telltales
Hastings Signal & Equipment Co.
Thawing Outfits
Q & C Co.
Ties
International Creosoting & Construction Co.
Tie Plates
Bethlehem Steel Co.
Interstate Iron & Steel Co.
Lundie Engineering Corp.
Tie Plate Clamps
Q & C Co.
Tie Rods
Bethlehem Steel Co.
Tie Spacers
American Chain Co., Inc.
Maintenance Equipment Co.
Tie Tampers
Electric Tamper & Equipment Co.
Ingersoll-Rand Co.
Syntron Co.
Timber, Creosoted
International Creosoting & Construction Co.
Tile, Roofing
Federal Cement Tile Co.
Tools, Oxy-Acetylene Cutting & Welding
Oxweld Railroad Service Co.
Tools, Pneumatic
Ingersoll-Rand Co.
Tools, Track
Buda Co.
Maintenance Equip. Co.
Q & C Co.
Verona Tool Works
Warren Tool & Forge Co.
Woodings Forge & Tool Co.
Tongue Switches
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. Co., Wm.
Torches, Oxy-Acetylene Cutting & Welding
Oxweld Railroad Service Co.
Track Drills
See Drills, Track
Track Gages
Buda Co.
Kalamazoo Railway Supply Co.

Track Jacks
See Jacks, Track
Track Liners
See Liners, Track
Track, Portable
Western Wheeled Scraper Co.
Track Tools
See Tools, Track
Treating Plants, Water
American Water Softener Co.
Trestle Slabs
Massey Concrete Products Corp.
Tunnel Warnings
Hastings Signal & Equipment Co.
Ventilators
Johns-Manville Corp.
Warning Devices, Bridge & Tunnel
Hastings Signal & Equipment Co.
Water Softening Plants
American Water Softening Co.
Water Supply Contractors
Layne & Bowler Mfg. Co.
Water Treating Plants
American Water Softening Co.
Waterproofing Fabrics
Barber Asphalt Co.
Johns-Manville Corp.
Lehon Co.
Weed Burner
Wooling Machine Co.
Weed Killer, Chemical
Chipman Chemical Engineering Co., Inc.
Welding, Oxy-Acetylene
Oxweld Railroad Service Co.
Welding & Cutting Equipment
Oxweld Railroad Service Co.
Well Systems
Layne & Bowler Mfg. Co.
Wheels, Hand & Motor Car
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Parsons Co.
Woolery Machine Co.
Windshields
Mudge & Co.
Fairbanks, Morse & Co.
Wire
Interstate Iron & Steel Co.
Wire Fencing
Cyclone Fence Co.
Page Fence & Wire Products Ass'n.
Wood Preservation
See Preservation, Timber
Woodworking Machinery
American Saw Mill Machinery Co.

ALPHABETICAL INDEX TO ADVERTISERS

IMPROVED HIPOWER PARKERIZED